Founded in 1832

RAILWAY LOCOMOTIVES AND CARS

APRIL 1955

One of Five Specialized Railway Age Publications

formerly Railway Mechanical and Electrical Engineer

Pooled Service on The Santa Fe

Interchange Rules Revisions

Electric Drive for Rotary Snow Plows

Mechanical Refrigeration

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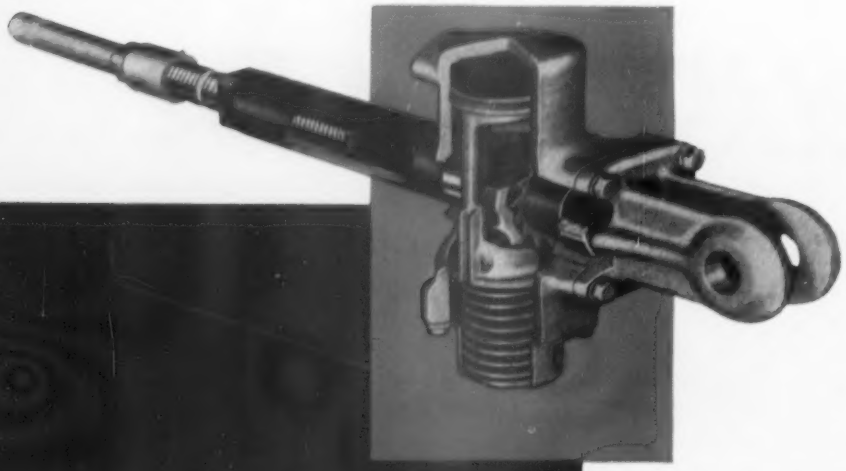

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RAILWAY LOCOMOTIVES AND CARS

Founded in 1832 as the American Rail-Road Journal

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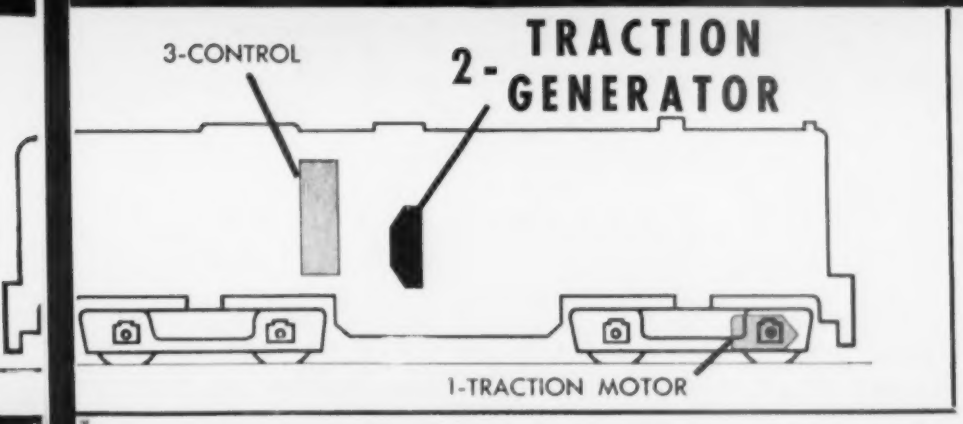

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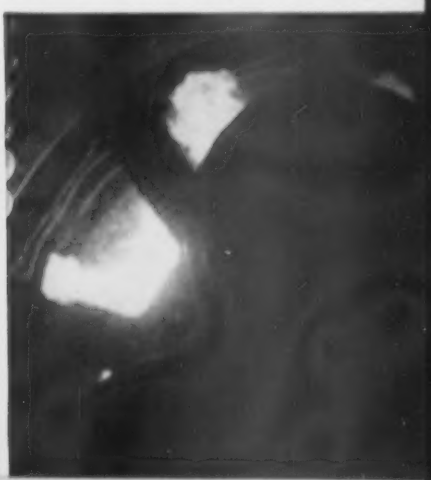
3. Climax is reached in violent explosion. Generator took over 400 flashovers in test.



NEWS. . . . . .

F. N. Houser, Jr.

F. N. Houser Joins Editorial Staff

Frederick N. Houser, Jr., formerly with the Bessemer & Lake Erie at Greenville, Pa., has joined the staff of *Railway Locomotives and Cars*, as associate editor, with headquarters at New York.

Mr. Houser was born on January 1, 1925, in Stoneboro, Pa. He is a graduate of Carnegie Institute of Technology (B.S. in M.E. 1947). He served with the U.S. Army during World War II, and from 1948 until 1954 had been employed on the B&LE as draftsmen, special engineer, and engine-house foreman. Previous to joining the staff of *Railway Locomotives and Cars*, he was with the Babcock & Wilcox Co. in Beaver Falls, Pa.

Mr. Houser, who also taught engineering drawing at Thiel College, Greenville, for 4½ years, is a licensed professional engineer in the State of Pennsylvania.

Proposed Designs of Passenger Equipment

At least four railroads soon will place orders for new passenger train equipment "startlingly different" from conventional designs, according to a joint announcement by the presidents of the Baltimore & Ohio, the Chesapeake & Ohio, the New Haven, the New York Central, the Pennsylvania and the Santa Fe.

After six months' study of all present and proposed designs for modern passenger equipment, during which time representatives of the railroads toured Europe and worked with the major car builders in the United States, it was decided that three distinct types of new train designs should be constructed and operated, the announcement said. These are in addition to a modified type of "Talgo" train being built by ACF Industries for the Rock Island.

The Santa Fe soon will decide upon a new design for equipment to be used first in its "El Capitan" between Los Angeles and Chicago.

The NYC has agreed to purchase a complete integrated train similar to the design known as "Train X." The road also is planning experimentation with moderate distance runs, such as New York-Buffalo and Chicago-Detroit, both for daylite and evening trips.

The New Haven will purchase a third type of train, being designed in cooperation

(*Continued on page 10*)

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE MARCH ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horse-power*	*Service*	*Builder*
Canadian National	23	1,200	Switching	General Motors Diesel, Ltd.
	10	1,200	Switching	Canadian Locomotive
	5	1,200	Switching	Montreal Locomotive
	6A[1]	1,600	Passenger	Montreal Locomotive
	6B[1]	1,600	Passenger	Montreal Locomotive
Chicago, Burlington & Quincy	30[2]	1,750	Yard	Electro-Motive
	10[2]	2,400	Passenger	Electro-Motive
	10[2]	1,200	Switching	Electro-Motive
Denver & Rio Grande Western	2A[3]	1,750	.....	Electro-Motive
	4B[3]	1,750	.....	Electro-Motive
	12[3]	1,750	Road switching	Electro-Motive
Montana Western	1	550	.....	Baldwin-Lima-Hamilton

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Atchison, Topeka & Santa Fe	100[4]	Refrigerator	Company shops
Chicago & North Western	226[5]	50-ton box	Pullman-Standard
Chicago, Burlington & Quincy	350[6]	50-ton box	Company shops
	400[6]	70-ton gondola	Company shops
	10[6]	125-ton flat	Company shops
	190[6]	50-ton flat	Company shops
	50[6]	70-ton flat	Company shops
Chicago Great Western	107	70-ton covered hopper	Pullman-Standard
	10[7]	Caboose	International Ry. Car
Gulf, Mobile & Ohio	100[8]	50-ton pulpwood	Company shops
Illinois Central	35[9]	50-ton box	Company shops
Western Maryland	100[10]	70-ton covered hopper	Greenville Steel Car

FREIGHT-CAR LEASES

New York, New Haven & Hartford	200[11]	Flat	

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Northern Pacific	2[12]	.....	Budd Co.

[1] For delivery this month.
[2] For delivery during second half of this year.
[3] The A and B units, type F-9; the passenger units, Type GP-9. Scheduled for July and August delivery. Total estimated cost of 18 units, approximately $3,200,000.
[4] In addition to 50 reported in the March issue, page 6. These 50-ft mechanically refrigerated cars will be insulated for transporting frozen foods at temperatures of zero or lower.
[5] For delivery this month.
[6] For delivery during second half of 1955.
[7] Delivery of hopper cars expected last month; delivery of caboose cars to begin this month and be completed in June. Estimated cost of hopper cars, $92,000. Estimated cost of caboose cars $159,000.
[8] In addition to 100 reported in the December issue, page 14.
[9] Estimated unit cost, $5,500.
[10] To be equipped with roller-bearing trucks. Construction scheduled to begin in June.
[11] Under lease from Piggy-Back, Inc., for "piggyback" operation. To be similar to two units built in shops of the New Haven and now in experimental operation. Builder of 200 units not yet determined. To cost approximately $8,000 each.
[12] One 70-passenger (RDC-2); one 48-passenger (RDC-3).

NOTES:

New Haven.—The biggest single improvement program ever to be undertaken by this road will represent an investment of $64,000,000 during the next five years, according to Patrick B. McGinnis, president. The initial phase will begin as quickly as orders can be placed and contracts signed. Among the projects in the program are heavy repairs to be made to 517 gondola cars, which, when in good shape again, will be sold to the International Railway Car Company, of Buffalo, and then leased back for the New Haven's use for $45 a month. After five years the lease can be renewed for another five years at $1.80 per month, upon completion of which the cars are expected to be no longer useful. The rental income these cars will bring in to the NH while they are being used on other lines is expected to exceed the rent the NH must pay to International.

General Motors.—"The first of the new style passenger coach designs expected to be on the rails is being developed by General Motors," according to a recent issue of the Pennsylvania employees' magazine, The Pennsy. "It will come to the PRR for inspection and test runs," The Pennsy says. General Motors sources, however, have declined to confirm this report. The "coach designs" which The Pennsy says General Motors is developing should not, apparently, be confused with the "completely new type of passenger train" which the PRR is understood to be working out with another builder. [See "Proposed Designs of Passenger Equipment" beginning on this page.—Editor.]

"Old Maud," the first Mallet-type locomotive built in the United States, was placed in service by B&O in 1904. She had a single huge boiler which powered two sets of drivers turning independently of each other. These permitted her to develop a tractive effort of 71,500 and negotiate mountain curves with heavy payloads.

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ESSO Hot Box Compound
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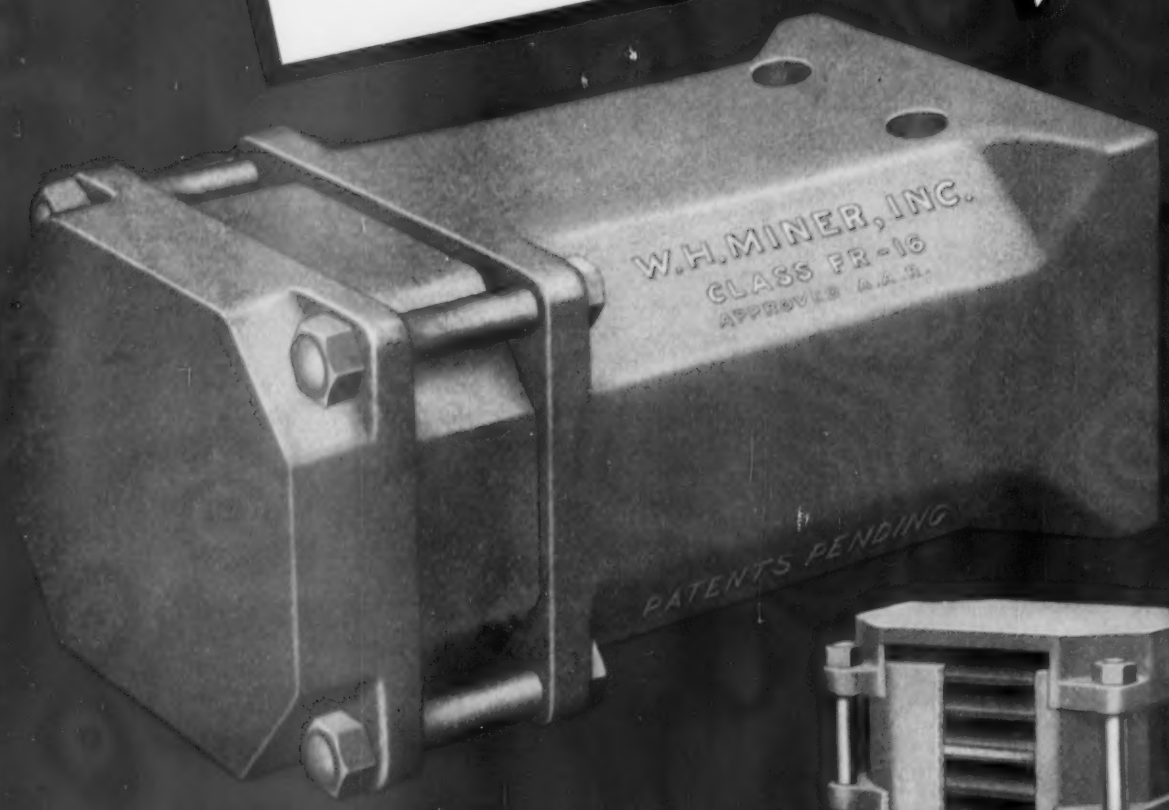
INTRODUCES THE



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INEXHAUSTIBLE ENDURANCE

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MAXIMUM PROTECTION AT EVERY FRACTION OF TRAVEL

W. H. MINER, INC. CHICAGO

(Continued from page 6)

with Grumman Aircraft Company engineers. The New Haven will concentrate on its main-line New York-Boston service.

The Pennsylvania's Board of Directors has "authorized construction" of a train, incorporating a "wholly new coach design, combining 'close-to-the-rail' glider riding qualities with full-strength tubular construction."

The basic design of the train, according to President J. M. Symes will have "the lowest center of gravity of any train yet engineered."

Consisting of seven coaches and a power car for air conditioning, heating and lighting, the new PRR train will accommodate nearly 600 passengers. It will be used at first in "moderate distance" service between major cities on schedules "materially faster than would be comfortable on conventional trains," Mr. Symes declared. It will cost approximately $1,000,000. Initially, existing diesel-electric or electric locomotives will be used, depending on the service to which the train is assigned.

"With probable quantity production of this type of train in the future, resultant lower construction costs and the lower operating and maintenance costs which are assured, I believe we can look toward a substantial reduction in the cost of providing railroad passenger service," Mr. Symes said.

"The new cars will differ radically from conventional railroad equipment, in that the floor, sidewalls and roof will constitute a car-length tube of great strength. This eliminates the need for a heavy steel 'center sill', and provides a lower, less weighty body structure."

He said another advantage of the design is that, with the elimination of the center sill, the car floor can be depressed in the center section between the wheels, opening the way to an "interesting two-level floor arrangement, providing a center of gravity almost a third lower than in conventional cars."

"The center of gravity of the cars determines the speed at which trains may round curves without discomfort to passengers," Mr. Symes explained. "Low centers of gravity are inherent in diesel and electric locomotives, so that by reducing that factor in the cars we can materially quicken train speeds on curves with full safety and comfort for the passengers. Important reductions in running time will result."

The new cars will be 21 in. lower overall than existing coaches, will weigh only 60% as much, and will ride on a four-wheel truck under each end. The reduction in weight permits use of the smaller wheels, contributing to less car height. Each car will be 85 ft long, and will accommodate 84 passengers in reclining seats. Lavatory facilities will be provided in each car, as well as space for hand baggage.

The two-level floor design with seats on the higher level for 12 passengers at each end and for 60 passengers on the lower level, will provide entrance vestibules designed for boarding and alighting at either track-level or regular station platforms.

"This new train was developed by the Mechanical Research Committee set up by six railroads, including the Pennsylvania, to plan passenger trains of entirely new types completely adapted to modern transport needs," Mr. Symes said. "The tubular design and the other developments which characterize this approach to rail travel are among the results of the committee's six month's study of all present and proposed concepts for modern passenger equipment in this country and abroad."

He added that cars may be readily attached to or taken from the train, giving it desirable flexibility in meeting varying traffic demands and making for more efficient operation.

Mr. Symes said that orders for the new train would be placed as soon as detailed specifications are completed.

The railroads cooperating in developing the new train designs will share all information regarding engineering and economic results, as well as details of passenger acceptance, and thereby pool experience to guide any future development work.

In addition to these train designs, General Motors Corporation is developing an experimental train with a special high-speed diesel locomotive with the intention of having it available to railroads for trial use, starting in late 1955, the joint announcement said.

Howard E. Simpson, president of the Baltimore & Ohio, and Walter J. Tuohy, president of the Chesapeake & Ohio, the two other cooperating railroads in a group of six, temporarily postponed any announcement of their plans.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Item No.		Month of December 1954	Month of December 1953	12 months ended with December 1954	12 months ended with December 1953
	Freight Service (Data from I.C.C. M-211 and M-240)				
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	5,212	8,657	73,193	142,863
3-06	Total, Diesel-electric	34,315	31,470	391,432	375,352
3-07	Total, electric	655	614	7,791	8,589
3-04	Total, locomotive-miles	40,408	40,830	474,313	527,650
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,524	1,439	18,147	19,756
4-06	Empty, total	942	935	10,634	11,055
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	11,199	15,690	148,871	259,933
6-02	Total in oil-burning steam locomotive trains	1,369	3,009	26,179	67,885
6-03	Total in Diesel-electric locomotive trains	93,572	83,514	1,081,817	1,044,854
6-04	Total in electric locomotive trains	1,993	1,699	23,912	24,400
6-06	Total in all trains	108,870	104,207	1,287,177	1,399,875
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.02	1.02	1.02	1.03
10-02	Loaded freight car-miles	40.40	37.90	41.00	40.50
10-03	Empty freight car-miles	25.00	24.60	24.00	22.70
10-04	Total freight car-miles (excluding caboose)	65.40	62.50	65.00	63.20
10-05	Gross ton-miles (excluding locomotive and tender)	2,885	2,742	2,906	2,873
10-06	Net ton-miles	1,261	1,188	1,287	1,301
12	Net ton-miles per loaded car-mile (M-211)	31.20	31.40	31.40	32.10
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	61.80	60.60	63.10	64.10
14	Averages per train hour (M-211):				
14-01	Train miles	18.90	18.70	18.70	18.20
14-02	Gross ton-miles (excluding locomotive and tender)	54,006	50,806	53,897	51,750
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	43.60	41.20	42.80	45.40
14-02	All	40.90	39.30	40.30	43.20
15	Average net ton-miles per freight car-day (M-240)	789	747	799	890
17	Per cent of home cars of total freight cars on the line (M-240)	53.60	55.10	53.10	47.10
	Passenger Service (Data from I.C.C. M-213)				
3	Road motive-power miles (000):				
3-05	Steam	2,049	3,428	26,593	48,713
3-06	Diesel-electric	21,829	21,721	250,918	243,606
3-07	Electric	1,477	1,574	16,659	18,281
3-04	Total	25,358	26,723	294,175	310,601
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	266,895	276,750	2,964,368	3,141,066
4-09	Total in coal-burning steam locomotive trains	10,946	18,625	131,219	269,337
4-10	Total in oil-burning steam locomotive trains	7,769	12,460	99,684	170,119
4-11	Total in Diesel-electric locomotive trains	231,337	228,031	2,548,482	2,498,397
2	Total car-miles per train-miles	10.18	10.04	9.71	9.78
	Yard Service (Data from I.C.C. M-215)				
1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	262	416	3,626	6,877
1-02	Steam, oil-burning	51	63	649	1,201
1-03	Diesel-electric[1]	3,477	3,402	39,647	41,291
1-06	Total	3,799	3,898	44,025	49,601
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	12	18	141	236
2-02	Steam, oil-burning	5	4	62	74
2-03	Diesel-electric[1]	275	281	3,062	3,095
2-06	Total	320	335	3,576	3,786
3	Hours per yard locomotive-day:				
3-01	Steam	4.80	5.40	4.80	6.70
3-02	Diesel-electric	15.40	15.40	15.00	16.10
3-05	Serviceable	15.00	14.30	14.50	14.90
3-06	All locomotives (serviceable, unserviceable and stored)	13.00	12.50	12.40	13.20
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.73	1.87	1.69	1.74
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.74	.75	.75	.75

[1]Excludes B and trailing A units.

Freight Cars Owned Down 41,296 in 1954

Despite a loss of 41,296 freight cars owned by Class I roads last year, the daily number of surplus serviceable cars ranged from 28,000 to 140,000 according to A. H. Gass, chairman, Car Service Division, Association of American Railroads.

In a recent report on "The National Transportation Situation," Mr. Gass states that Class I roads and their car-line affiliates placed 30,562 new cars in service and retired 71,858 in 1954. The total of cars owned as of January 1, was 1,816,752 against 1,858,048 on January 1,1954. With 119,722 cars awaiting repairs at the first of the year, Mr. Gass reported, there was a total of 1,697,030 serviceable cars owned January 1 against 1,766,629 a year ago.

He also reported "the smallest average shortage" for the past 12 years with shortages ranging from a minimum of 15 to a high of 3,664, mostly among high grade wide-door or 50-foot box cars.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
December, 1951	2,752,316	2,130	5,398	7,528	365,611
December, 1952	2,869,928	1,742	3,632	5,374	534,040
1953					
January	2,828,906	2,219	4,123	6,342	446,059
February	2,625,563	2,111	4,059	6,170	425,537
March	2,904,227	2,696	6,077	8,769	331,192
April	2,850,752	3,383	6,435	9,818	290,359
May	3,013,610	5,892	11,433	17,325	173,945
June	2,926,001	8,537	15,296	23,833	122,771
July	2,925,317	9,342	15,775	25,117	116,467
August	2,971,020	8,638	14,160	22,798	130,319
September	2,822,222	6,083	10,195	16,278	173,376
October	3,042,558	3,863	6,493	10,356	293,796
November	2,788,773	1,987	3,404	5,391	517,301
December	2,656,053	1,581	2,550	4,131	642,958
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,833	455,813
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070

Mills Advises Attention to Brake Tests

Non-observance of the rule requiring air-brake tests at points where motive power or crews are changed "is at present causing considerable concern, and in many locations proper adjustment of piston travel is being sadly neglected," S. N. Mills, assistant director of the ICC's Bureau of Safety and Service, said at the March 11 meeting of the Eastern Car Foreman's Association in New York. "These are matters which should be given careful and continuing attention by all railroads," he continued.

Mr. Mills also discussed legal aspects of railroad proposals to establsh joint car-repair facilities at interchange points. At such facilities, cars having defective safety appliances, which were discovered when they were offered in interchange, could be repaired with a minimum delay and back-haul movement.

The proposals grew out of a resolution wherein the National Association of Shippers Advisory Boards suggested that the Association of American Railroads make a study designed to effect arrangements which would permit the forwarding of a rejected car to the nearest repair shop of the receiving or delivering carrier. The plan for joint repair facilities at interchange points was suggested by the general committee of AAR's Operating-Transportation Division.

As Mr. Mills pointed out, the law's general requirement is that movement of a defective car to a place of repair can be made only by the carrier upon whose line the car became defective. If, however, a defective car is offered in interchange in association with other cars that are not defective, a receiving carrier may, in refusing the defective car, perform such incidental switching as is necessary to separate it from other cars.

And the incidental switching may be to a joint repair track "if such disposition would require no more handling than would otherwise be required in consummating refusal," Mr. Mills said. On such joint track, the car would be at the nearest repair facility of the responsible carrier, and "it is not material by whom the repairs are made," he added.

In a recent circular dealing with the proposal, AAR Vice-President R. G. May said the arrangement "would permit the receiving line to make repairs and accept cars in interchange that are now being delayed on account of back-haul movement to a repair point on the line of the delivering carrier." Mr. May added that any such arrangement should be submitted to Mr. Mills for clearance.

In another part of his New York address, the assistant director of the ICC bureau referred to pending revision of the commission's order prescribing safety appliance standards. He said that "few, if any, radical changes" appear in the proposed new order, which does, however, have 26 classifications of cars and locomotives as compared with the present order's 18.

PERSONAL MENTION

Atchison, Topeka & Santa Fe

J. ROBERT PHELPS, general machine shop foreman at San Bernardino, Cal., has retired.

Atlantic Coast Line

D. B. LACY, master mechanic at Jacksonville, Fla., appointed assistant superintendent motive power, Southern division with headquarters at Waycross, Ga.

G. R. GIBBS, diesel foreman at Jacksonville, Fla., appointed master mechanic.

Baltimore & Ohio

EDWARD L. BROWN, master mechanic in charge of Staten Island Rapid Transit repair shops, appointed superintendent of B&O floating equipment, with headquarters in New York.

Staten Island Rapid Transit Railway Co.

R. W. BALDINGER appointed master mechanic, with headquarters at St. George, S.I., N.Y.

Canadian National

WILLIAM P. MOFFAT, transportation engineer, appointed chief of research at Montreal.

PHILIP L. MATHEWSON, chief of research at Montreal, appointed assistant chief of motive power and car equipment, system.

JAMES A. MCDONALD appointed assistant to vice-president of research and development at Montreal.

K. W. THOMPSON, mechanical engineer at Montreal, appointed general foreman of Stratford, Ont., motive-power shops.

Central of Georgia

WILLIAM H. MIMS, electrical engineer, appointed superintendent of motive power and equipment at Savannah, Ga. *Born*: May 6, 1909, at Beatrice, Ala. *Education*: Alabama Polytechnic Institute (B.S. in E.E. 1932). *Career*: Began in 1942 as draftsman, mechanical department, Georgia Railroad. Following year draftsman, chief engineer's

(Continued on page 81)

Four wheel truck side frame castings for this flat car were produced by The Buckeye Steel Castings Company, Columbus, Ohio. Span Bolster Castings and the Truck Bolsters (transverse bolsters) were made of a cast nickel-manganese steel to meet A.A.R. Specification M-201, Grade C, calling for minimum mechanical properties as follows:

Tensile Strength, p.s.i.	90,000
Yield Strength, p.s.i.	60,000
Elongation in 2" %	22
Reduction of Area %	45

Nickel Plate goes Nickel

Adds strength and cuts weight with nickel steel underframe and truck castings

Capacity of the flat car illustrated was increased from 493,000 lbs. to 500,000 lbs. by casting the underframe in a 2½% nickel steel . . .

. . . permitting 7,000 lbs. more in pay load than would have been available with carbon steel!

The addition of nickel increases the strength of the cast steel thus saving weight.

The one piece cast steel underframe for this car was produced by General Steel Castings Corp., Granite City, Ill., to meet the following minimum properties:

Tensile Strength, p.s.i.	75,000
Yield Strength, p.s.i.	48,000
Elongation in 2" %	25
Reduction of Area %	50

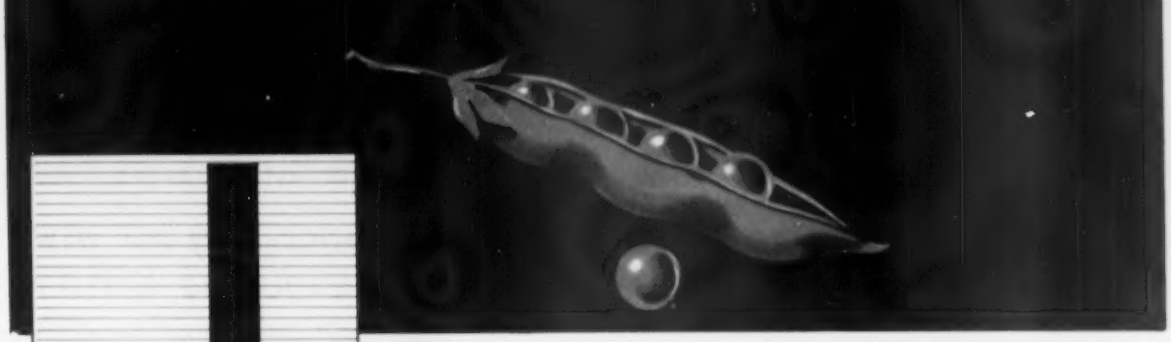
The use of nickel in these castings results in exceptional toughness at both normal and subzero temperatures . . . together with high fatigue strength and excellent ductility. If damaged, this nickel steel is easily repaired by welding.

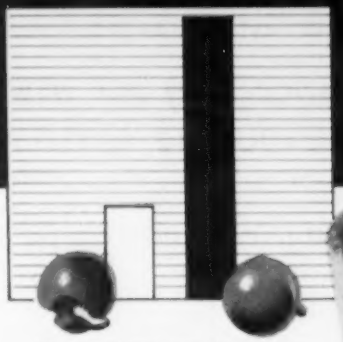
You will find many suggestions on ways to increase the life and earning capacities of your cars in our comprehensive booklet "Nickel Alloys in Railroad Equipment." Write for your copy and any other information you need.

INCO
TRADE MARK

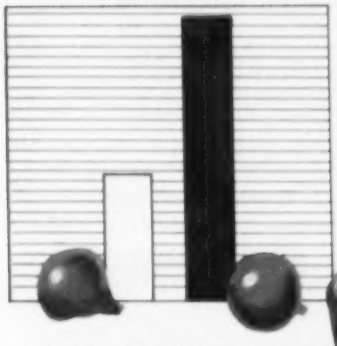
THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.

DO YOU BELIEVE THAT OIL FILTERS ARE AS ALIKE AS PEAS IN A POD?

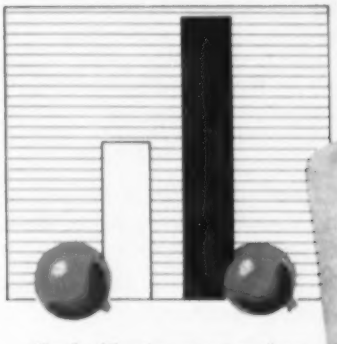




Filter cartridges may have "worm holes" too. Because WIX Cartridges don't channel, they give longer, better service.



When a cartridge collapses in service, its performance drops. WIX density is electronically controlled.



"Look alikes" may not perform alike. Field and laboratory tests prove that WIX Engineered Filtration makes dollars do more work.

THE PROBLEM OF *KEEPING OIL CLEAN* IS IMPORTANT—DOUBLE CHECK FILTERS!

Engineered Filtration goes deep into the technical aspects of oil filter cartridges to deliver the outstanding performance you enjoy with WIX products. WIX Cartridges are handsome, yes . . . but their efficiency, long service and dependability show up most clearly on the balance sheet. The protection WIX delivers to your engines makes the big difference.

Whether the problem is filtering diesel fuel or lubricating oil, WIX's complete coverage and WIX Engineered Filtration represent the sound answer for Railroad Diesel Engines and Maintenance-of-Way Equipment. Here's Filtration keyed to YOUR specifications . . . YOUR equipment . . . YOUR type of operation . . . it makes sense and saves money for you!

WIX research and engineering is constantly testing and studying YOUR oil filtration problems—both in the laboratory and in the field. These facilities and this "know-how" is freely available to you.

Write for the complete WIX catalog or for the assistance of WIX engineers on your filtration problems.

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A NEW STANDARD FOR RAILWAY PERFORMANCE...AN ALL NEW ENGINEERED CAR LIGHTING AND AIR CONDITIONING BATTERY

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FULL RATED POWER FOR A LONGER WORKING LIFE

10% LONGER PLATES

Compare all railroad batteries . . . recognize why the EH Exide-Ironclad is a new standard for railroad car lighting and air conditioning.

Our standards are higher . . . the new EH Exide-Ironclad delivers 100% capacity initially—not 85%. Uniform quality assures sustained high capacity during longer useful life.

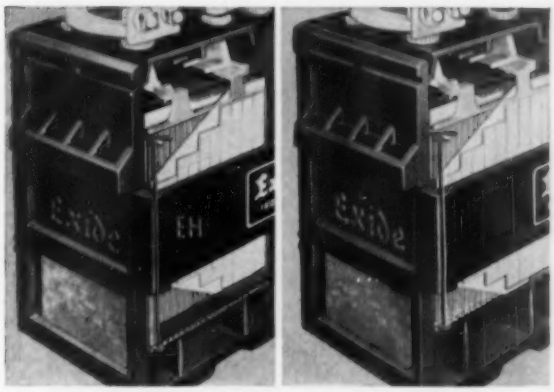
You get a new kind of a high capacity battery when you buy the EH Exide-Ironclad *plus* these Exide-Ironclad exclusive features:

- **New alloys**
- **New plastics**
- **Slotted tube construction of the Ironclad Positive plate, permanently sealed on the bottom with polyethylene tube sealer. More active material is exposed to the electrolyte, resulting in greater power. More active material is retained, providing higher battery capacity for a longer working life.**

New engineering designs toward simplification and new modern manufacturing facilities assure high, uniform quality.

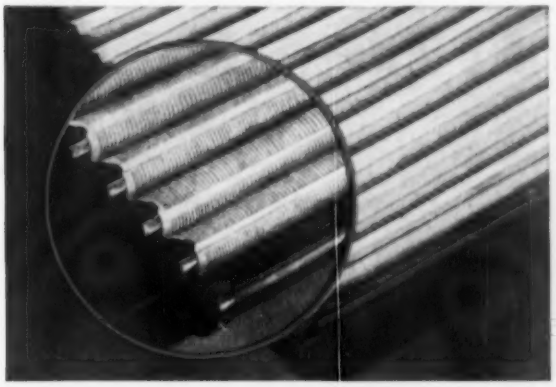
Write for specifications of this new standard for railway battery performance.

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

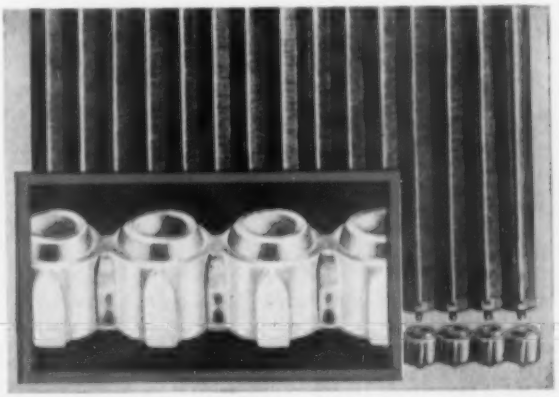


10% LONGER PLATES—10% more active material in the same space for a new kind of high capacity battery performance . . . new positive plates balanced with new stable voltage negative plates for full rated power initially . . . full rated power sustained for a longer working life.

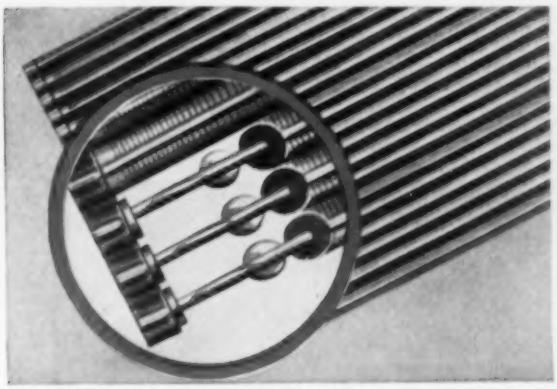
QUALITY CONTROL — continuous research . . . simplification of the design . . . new manufacturing techniques in casting and blending . . . more certain controls of production . . . result in high, uniform quality.



POLYETHYLENE SLOTTED TUBES—the non-oxidizing plastic tubes which retain active material in contact with the grid spine, yet permit the electrolyte to penetrate throughout the active material.



POLYETHYLENE TUBE SEALERS — this acid-proof plastic sealer fits snugly into the bottom of positive plate tubes, sealing in the active material . . . prevents shorts . . . increases useful working life of battery.



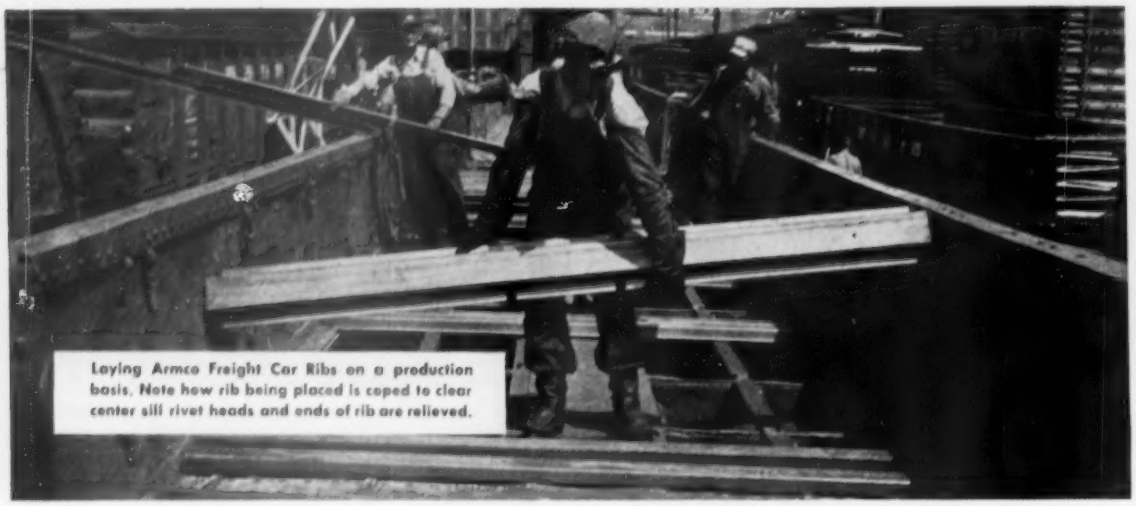
SILVIUM® — the latest development in grid alloy prevents wear of the positive grid spines of the Exide-Ironclad Positive plate . . . assures high sustained power and longer life.

ADD THEM ALL UP! You get . . . Bright Lights . . . Comfortable Cars . . . Worry-Free Performance . . . Lowest Overall Costs . . . The Best Battery Power Buy—At Any Price!

YOUR PASSENGERS DESERVE THE BEST

specify the NEW EH EXIDE-IRONCLAD

THE BEST POWER BUY—AT ANY PRICE



Laying Armco Freight Car Ribs on a production basis. Note how rib being placed is coped to clear center sill rivet heads and ends of rib are relieved.

YOU DON'T "FIT" THIS CAR FLOOR... IT'S FITTED FOR YOU

When you order Armco Freight Car Flooring for new cars or reflooring of old cars, we'll deliver steel ribs tailor-made for your job. Armco engineers study the blueprints of your car frames, then specify any changes needed in the standard steel floor sections to suit conditions.

Mill Makes Alterations

Ribs are often coped to clear rivet heads on center sill. Special steel planks are supplied to clear bolsters—where the use of wood nailing strips is impractical. Detailed assembly drawings are in your hands before the steel ribs and planks arrive.

This way, you can floor or refloor any one series of gondola, box or flat cars on a production basis. You needn't worry about costly fitting of parts.

When you install this composite steel and wood floor you can be sure of floors that have great strength, real nailability, as well as reinforced underframes. Gondolas become multi-purpose cars. There is less time out for repairs and you gain in operating economy.

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For complete information write for our new booklet, "Armco Freight Car Flooring," at address below.

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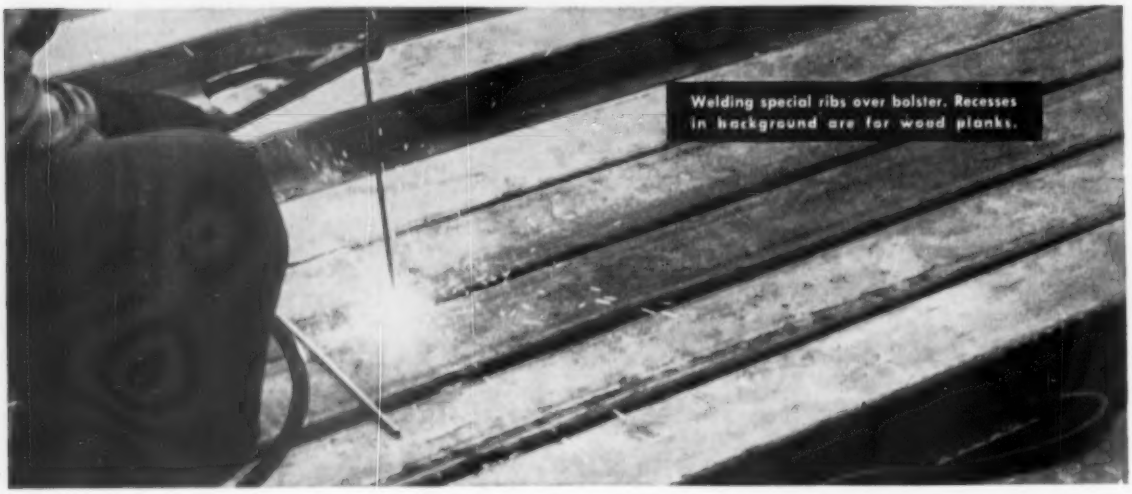


Welding special ribs over bolster. Recesses in background are for wood planks.

How OXWELD Trade-Mark Welding Rods Keep Diesels in Service

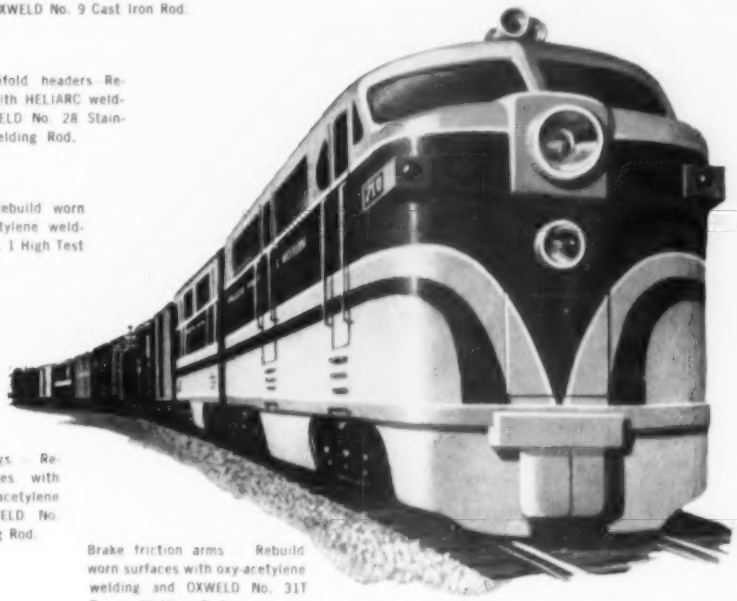
Cast iron cylinder heads — Repair cracks and rebuild valve seats with HELIARC or oxy-acetylene welding and OXWELD No. 9 Cast Iron Rod.

Aluminum pistons—Repair cracks and fill in ring grooves with HELIARC or sigma welding and OXWELD No. 23 Welding Rod or Wire.

Aluminum radiator parts—Repair cracks with HELIARC or sigma welding and OXWELD No. 23 Welding Rod or Wire.

Aluminum cooling blades — Repair breaks and cracks with HELIARC welding and OXWELD No. 23 Aluminum Welding Rod.

Exhaust manifold headers—Repair cracks with HELIARC welding and OXWELD No. 28 Stainless Steel Welding Rod.



Intake and exhaust valves — Build up worn faces with oxy-acetylene welding and HAYNES STELLITE Alloy No. 6 Rod.

Truck equalizers—Rebuild worn areas with oxy-acetylene welding and OXWELD No. 1 High Test Steel Welding Rod.

Diesel cylinder liners — Repair and adapt for water passage with HELIARC and oxy-acetylene welding and OXWELD No. 31T Bronze and No. 9 Cast Iron Welding Rods.

Motor suspension bearings — Rebuild worn face with HELIARC or oxy-acetylene welding and OXWELD No. 31T Bronze Welding Rod.

Axle thrust bearings — Renew worn surfaces with HELIARC or oxy-acetylene welding and OXWELD No. 31T Bronze Welding Rod.

Brake friction arms — Rebuild worn surfaces with oxy-acetylene welding and OXWELD No. 31T Bronze Welding Rod.

Malleable iron brake heads—Rebuild worn surfaces with oxy-acetylene welding and OXWELD No. 25M Bronze Welding Rod.

Compressor clutch sleeves — Renew worn teeth with oxy-acetylene welding and OXWELD No. 31T Bronze Welding Rod.

Brush holders—Build up worn surfaces with oxy-acetylene welding and OXWELD No. 27 Low-Temperature Bronze Welding Rod.

Here are some parts regularly restored by welding in leading diesel shops today. Repair welding returns damaged or worn parts to service quickly, maintenance welding keeps them there. In both types of work, OXWELD welding rods and wires assure strong welds that make diesel parts as good as new. That's because each OXWELD welding rod and wire is designed to do the best job possible—to insure an excellent weld.

Your diesel shop also can realize attractive savings by using OXWELD welding rods and wires for these and similar jobs. For further details, write LINDE for more information.

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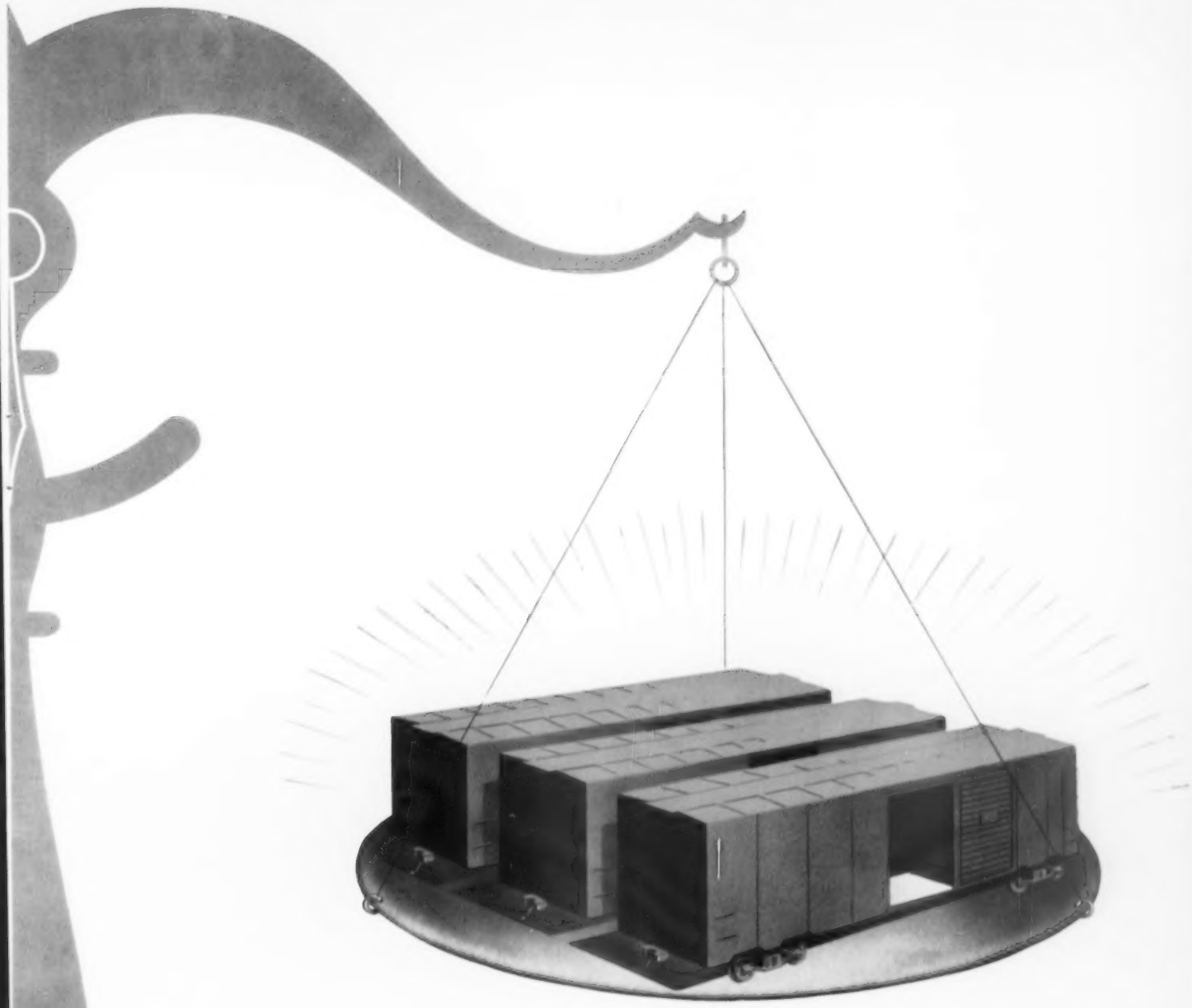
HOW MANY NEW CARS COULD YOUR OLD CARS BUY?

Look at it this way.
It's a fact that old freight cars demand far more maintenance than new equipment.
It's a fact... they have far less earning power because of excessive out-of-service periods for repairs.
It's a fact... they result in an extra high amount of freight claims.
And so... the tremendous savings made possible by timely replacements would equal the cost of *plenty* of new freight cars.



HOW MANY NEW CUSTOMERS WOULD YOUR NEW CARS GET?

According to the happy experience of other railroads... you'll get *plenty* of new customers, too. Not simply because of faster service... less damage. Shippers are just naturally attracted by the efficient "look" of new equipment.

Why not call in your nearby ACF Representative and learn about the extra advantages of ACF Freight Cars?

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CAR BUILDERS TO AMERICA'S RAILROADS

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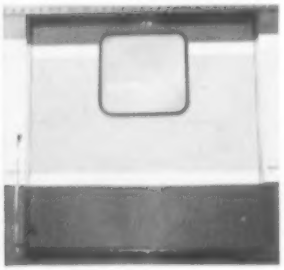
METAL BONDED TO PLYWOOD

DOORS

★ LIGHT... TOUGH... DURABLE
★ NO THROUGH-BOLTS
NO WARPING
★ NO TWISTING
NO SWELLING

BAGGAGE AND POSTAL CAR DOORS



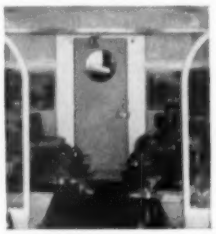
Completely weatherproof Met-L-Wood doors effectively prevent internal rust and rot... and their tough, smooth surfaces stay new-looking for years. Stainless steel channels along bottom edges of sliding doors are rustproof... virtually wearproof. All-rubber window sash installed or removed in minutes... rattle-proof... water- and weatherproof. Available in full width and split types ... sizes to meet all needs.

Exclusive Split Door Seal

Drawing above shows simple Met-L-Wood Split Door Seal which assures weather- and watertightness for years of continual use. Seal also provides effective cushion when closing split doors.

PASSENGER CAR END, VESTIBULE, INTERIOR DOORS

Sound-deadening, insulating, vibration-damping Met-L-Wood doors for passenger cars add to service life, cut deadweight ... Combine modern, clean-line beauty with great strength and durability. Furnished for manual or automatic operation, with or without hardware assembly. Tapping plates for hardware are built into doors ... invisible additions to strength and trouble-free service life. Sizes and types to fit all requirements ... exact dimensions insure quick assembly and perfect fit. Door thicknesses from ½" up, as required.



CABOOSE DOORS

Met-L-Wood caboose doors are built to last the life of the caboose—and to give trouble-free service the whole time. Weather-proof, warp-proof, rot-proof doors can be provided with or without stationary windows in all-rubber sash or with standard drop sash. Available with or without hardware. In all sizes to exactly meet specifications.

DIESEL LOCOMOTIVE DOORS

Widely used by builders on new locomotives, Met-L-Wood doors guarantee trouble-free operation of end and interior doors on diesel road locomotives and cab doors for diesel switchers. Furnished to exact dimensions, with or without windows; either with hardware installed, or with tapping plates placed for hardware assembly on the job.

Write for this Bulletin

Met-L-Wood Bulletin 520 gives the complete, illustrated story on Met-L-Wood doors for railroad uses ... shows construction details, describes standard and special types and sizes. Your copy sent free upon request—write for it today.

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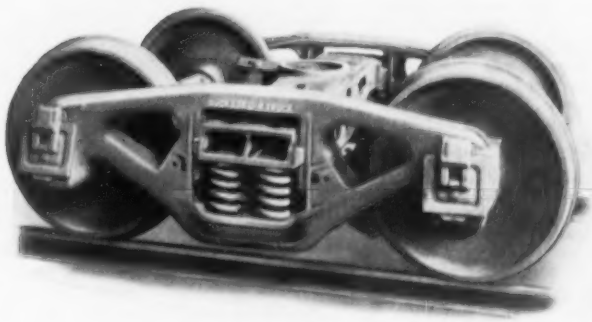
ACCURATE UNIPLANE* JIG GRINDING OF JOURNAL BOX LID FACE IMPROVES CLOSURE



* First featured on Buckeye's famed C-R (Cushion Ride) truck now standard process on all Buckeye trucks with integral journal boxes

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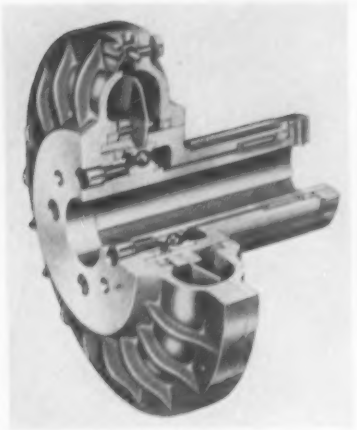


Sectional view of Flexidyne Drive

A *Dry* Fluid Drive

Flexidyne, a new development in industrial power transmission described as a *dry* fluid drive, is based upon a completely new principle. It handles difficult starting and reversing problems, and gives a new kind of protection against shock and overloads. Its major advantages are based on the fact that at normal operating speeds it does not slip. At the same time, in the case of an overload, it is slippage which gives protection.

Originated in Europe, the new drive has been redesigned by Dodge to American standards and will be available from stock through regular Dodge distributors. Actual delivery dates have not yet been announced.

It is claimed to have wide application for industrial drives involving heavy inertia and shock loads on such equipment as compressors, centrifuges, conveyors, and machines used in metal-working plants.

The Flexidyne drive is made up of a housing, inside of which a rotor is free to turn concentrically. Between the two are fine particles of spherical steel shot, called the "flow charge," which acts very much like a fluid. It is the flow charge which transmits power from the housing to the rotor. This flow charge is easy to seal in, has a high density and can stand relatively high temperatures.

The amount of the flow charge determines the torque capacity. Because it is easy to vary the amount of this charge, the Flexidyne will give the exact starting torque needed for anything from the smoothest to the fastest start.

Accurate overload protection is assured as the Flexidyne can be set to slip at anywhere from as low as a gentle 20 per cent over full load torque. During starting and overload periods the current draw is at a minimum, because with the standard Flexidyne setting the motor is never pulled down to less than 90 per cent of synchronous speed.

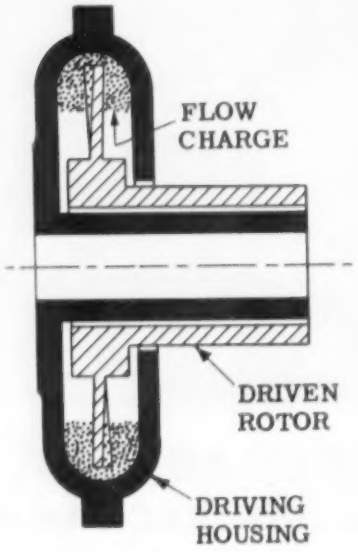
All this is due to Flexidyne's new principle, which produces constant torque for a given input speed, regardless of the percentage of slip between the rotor and the housing (which only occurs during starting or overload).

It is said that, with Flexidyne drive, uniform performance is assured regardless of changes in the surrounding temperature; the Flexidyne has long life and requires practically negligible manitenance.

Aside from Flexidyne's low first cost, low maintenance and top efficiency, it permits the use of smaller, cheaper motors and controls, with greatly reduced current demands and improved power. Its smoother starts and gentler overload protection avoid breakage and reduce maintenance on drives, gears, bearings, and driven machinery.

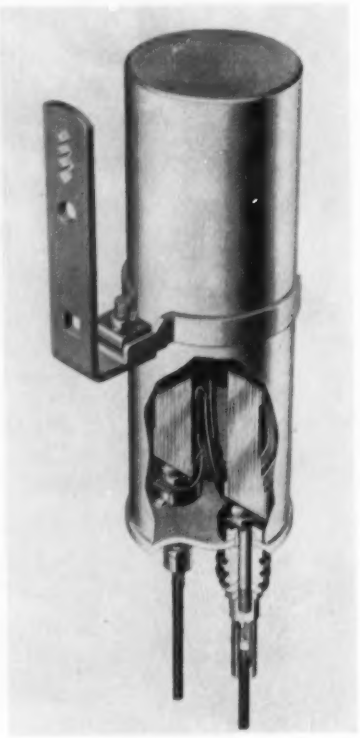
Each size has a standard horsepower rating and yet it is only a matter of minutes to vary the flow charge to give the exact torque required to suit a particular job.

Two lines will be available: (1) Flexidyne drives for convenient mounting directly on motor shafts and adapted for Dodge Taper-Lock sheaves, and (2) Flexidyne couplings, with Taper-Lock bushings for straight line drives. First to be offered from stock will be four sizes of Flexidyne drives, rated at 3 to 30 hp at 1,800 rpm. Other sizes will follow. *Dodge Manufacturing Company, Mishawaka, Ind.*



HOW THE FLEXIDYNE DRIVE WORKS

1. The motor is connected to the housing, and starts it turning at no load.
2. The flow charge is thrown to the circumference of the housing, is compressed by centrifugal force, and revolves with the housing.
3. The rotor, connected to the load, is started and accelerated by the friction and wedging action of the revolving flow charge.
4. Rotor and housing reach identical speeds—the Flexidyne operates with *Zero Slippage* between motor and load at normal running speeds.
5. Before overloads cause damage, the Flexidyne rotor slips relative to the housing, overcoming the friction and wedging action of the flow charge. A thermal switch (optional) automatically cuts the electrical circuit if an overload persists.
6. The amount of the flow charge determines the torque transmitted.

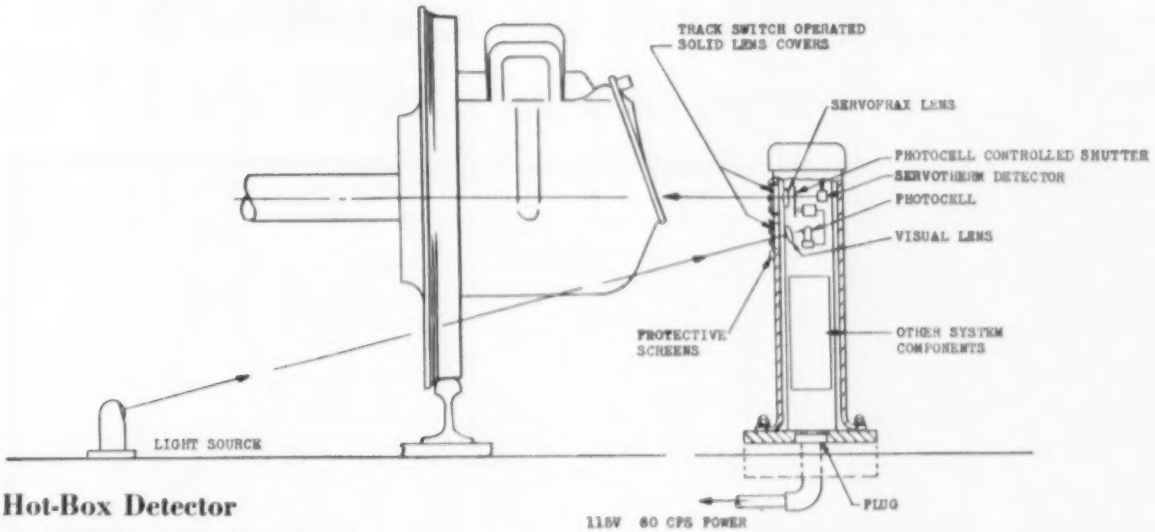


Low-Voltage Power Capacitor

This Type FPS 5-kvar capacity, single phase, 240-volt power capacitor has been designed for secondary distribution circuits. Designated Type FPS, it provides for mounting with terminals either up or down and is supplied with a galvanized steel bracket for direct pole mounting. An adapter converts the pole bracket into a standard EEI-NEMA cross-arm bracket.

Terminal-mounted fuses coordinated with the unit's rating are now available. One end of the fuse has a tapped connector nut that screws directly on the capacitor terminal stud. An insulated lead is attached to the other end.

Aluminum case construction gives permanent protection against atmospheric corrosion. Two insulated leads are supplied to permit easy connection to feeders. Approximate weight of the device is 25 lb; and length, 26-7/16 in. *Westinghouse Electric Corporation, P.O. Box 2099, Pittsburgh 30, Pa.*



Hot-Box Detector

The SCA hot-box detector is a permanent trackside installation which automatically inspects journal boxes of passing trains by using infrared detection techniques. The device detects temperatures considered dangerous by reacting to infrared radiation.

In operation, a shutter, actuated by the passing train wheels, allows the balometer eye of the device to inspect each journal individually and consider its temperature. A reaction to the dangerous temperatures of 250 deg F and over takes form as an output pulse, which can be used to notify the train or engine crew by signals, audible or light, or indication conveyed to the train dispatcher; or trip a device for spraying a washable white paint over the defective car.

It is contemplated that these units can be installed at strategic points along the right-of-way conforming to the standard clearance to take advantage of patterns in hotbox recurrence during extremes in seasonal temperature, and to insure maximum protection to freight movement during long, high speed runs. *Camef Equipment Corporation, 224 South Michigan, Chicago.*

Generator to Supply Cleaning Steam

The Upgrader Jr. Model 5090 steam cleaner can now be had with a four-cycle gasoline engine, making it completely portable for cleaning jobs away from the shop where electric current is not available. The cleaner will also continue to be made with an electric motor to drive the water pump and blower.

The cleaner builds up effective steam cleaning pressures in less than two minutes, with a forced draft fire that burns kerosene or No. 2 oil and consumes 1½ gal of fuel per hour. It is mounted on two shop wheels with semi-pneumatic tires, with an extended handle so the unit can be moved about a shop or placed on a trailer to be towed by car to do isolated cleaning jobs.

Cleaning is done with wet steam at 70 to 120 lb pressure, with or without cleaning solution, which does not go through the coils but is siphoned out of a separate container by the steam and mixed with the steam in the cleaning gun. The steam cleaning gun has an expanded metal handle to keep the operator's hands from getting hot. The gun is attached to 20 ft of steam hose and an acid-resisting cleaning solution hose.

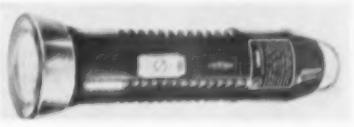
The Upgrader Jr. weighs 250 lb ready for shipping and is 37 in. high, 41 in. long and 21 in. wide. *Vapor Heating Corporation, Railway Exchange, Chicago 4.*

Clear Alkyd Varnish

This varnish, resistant to scrubbing and abrasion, dries in 2-½ to 3 hr and surfaces coated with it can be put into service after 12 hr. Formulated from a clear alkyd resin, the varnish may be used on wood, metal, and linoleum, for either interior or exterior surfaces.

Waterspar Varnish Extra Pale Clear, is for use where a minimum amount of discoloring is desirable, either new or after aging. As a linoleum or linowall coating, it offers protection without discoloring delicate patterns.

It is said to be free-flowing and easily applied by brush. The product may also be used as a sealer on plywood, knotty pine paneling and other wood surfaces by thinning with mineral spirits. *Paint Division, Pittsburgh Plate Glass Company, 632 Fort Duquesne Boulevard, Pittsburgh 22.*



Industrial Flashlights

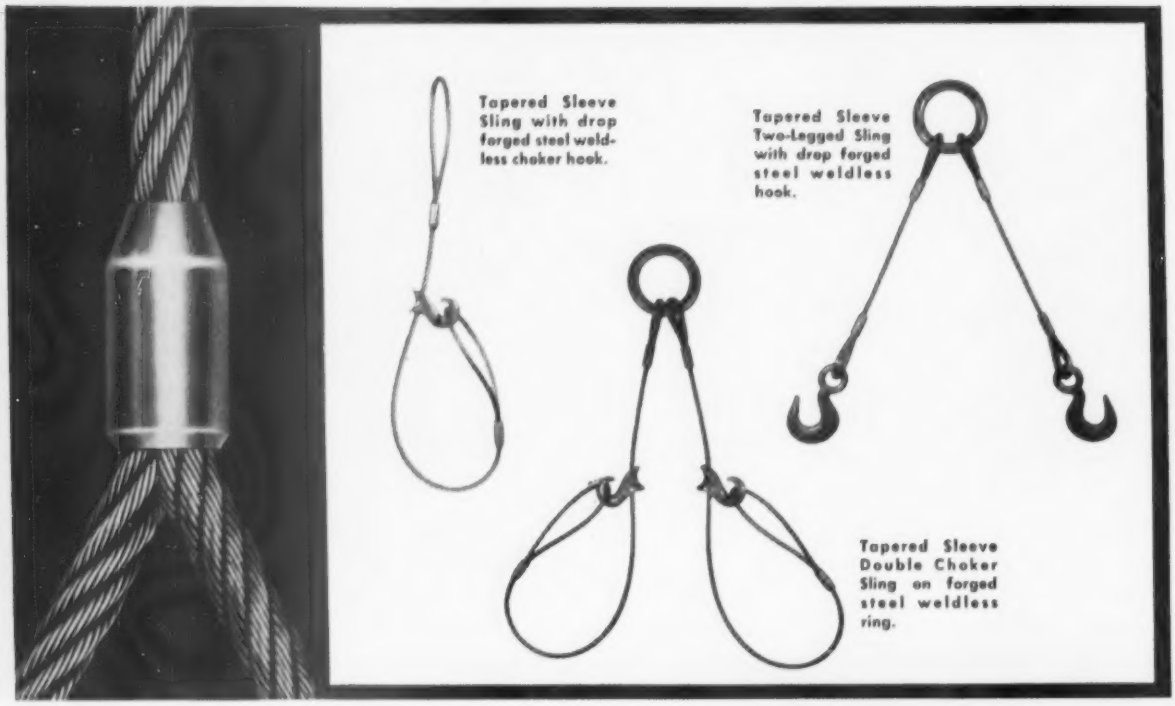
These units are recommended for use by railroads and other industries requiring rugged dependability long life and safe operation. They have been made available

(Continued on page 89)

THEY'RE ALL STEEL—RESIST KINKING, CRUSHING—

ROEBLING SLINGS

WITH TAPERED SLEEVE


Tapered Sleeve Sling with drop forged steel weldless choker hook.
Tapered Sleeve Two-Legged Sling with drop forged steel weldless hook.
Tapered Sleeve Double Choker Sling on forged steel weldless ring.

ROEBLING SLINGS are made of Preformed "Blue Center" Steel Wire Rope with independent wire rope core. *All steel,* they have top resistance to kinking and crushing . . . are easy to handle all through their working lives. Their tapered sleeve splices are strong as the rope itself and require no allowances.

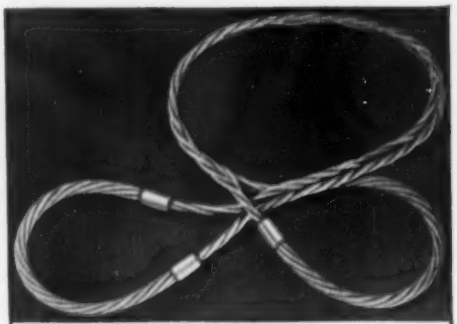
What's more, the streamlined tapered sleeves won't "hang up" on loads or other equipment. All strand ends are permanently secured beneath the sleeves; no strand or wire ends protrude to cause injury in handling.

Roebling Slings are delivered ready for work. They can be furnished as chokers or in any multi-leg construction with a galvanized steel thimble with attached hook, link or shackle. Write for descriptive folder, and adopt Roebling Slings for new efficiency. John A. Roebling's Sons Corporation, Trenton 2, N. J.

ROEBLING CF

Subsidiary of The Colorado Fuel and Iron Corporation

BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 6525 W. ROOSEVELT RD. • CINCINNATI, 2353 FREDONIA AVE. • CLEVELAND, 13235 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 5216 NAVIGATION BLVD. • LOS ANGELES, 5340 S. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1950 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.



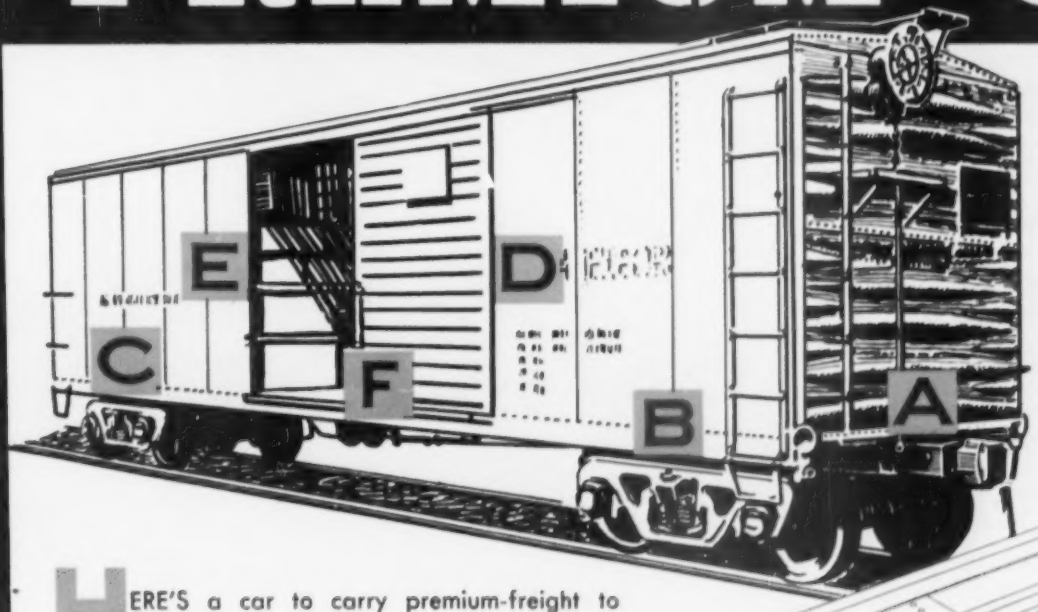
ROEBLING "FLATWEAVE" SLINGS

have some very special advantages. They're extra kink-resistant . . . easy to handle . . . their broad, flat bearing surface protects the load and prolongs sling life. Write for copy of the "Sling Data Book" that describes "Flatweaves" and gives information of real value to every sling user.

'PREMIUM' POWER *paid off!*

NOW IT'S THE

'PREMIUM' CAR



The only Cushion Underframe that eliminates free-slack, the Waugh High Capacity Cushion Underframe protects cars and lading at impact speeds far above the closing speed of conventional draft gears.

Studies indicate that this cushioning device will cut lading damage cost and car repair costs by half. Inquiries invited.

HERE'S a car to carry premium-freight to build traffic that pays a profit. Cushion Underframe equipped A it protects lading against excessive impacts. With improved trucks B and improved bearings C it is a smooth riding car. Extra wide doors D facilitate mechanical loading. Load retainers E reduce shifting and surfaced floors F are smooth and clean.

Every device is proven . . . the protection afforded actual. It is the freight car of tomorrow *ready today*.

90,000 lbs. of protection

WAUGH

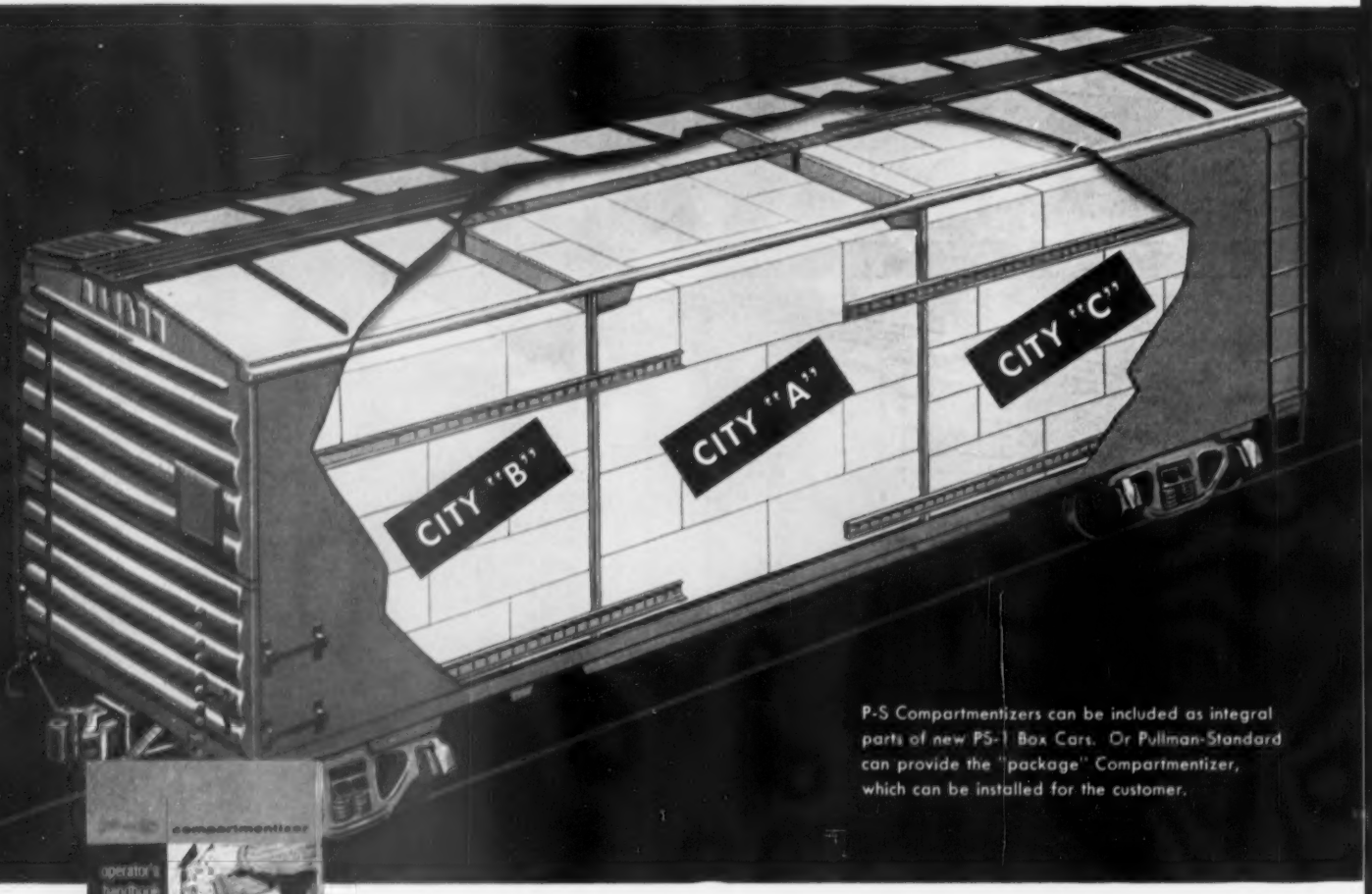
EQUIPMENT COMPANY 420 Lexington Ave., New York 17, N. Y.

CHICAGO · ST. LOUIS · CANADIAN WAUGH EQUIPMENT COMPANY, MONTREAL

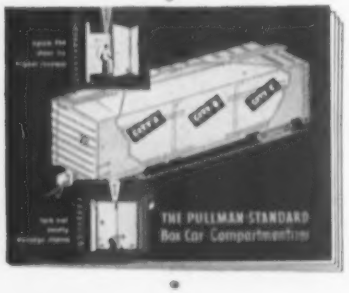
NOW

P-S Compartmentizer

- **Protects lading, reduces damage claims.**
- **Speeds handling, prevents pilfering and mix-up.**
- **Builds freight traffic revenues.**



P-S Compartmentizers can be included as integral parts of new PS-1 Box Cars. Or Pullman-Standard can provide the "package" Compartmentizer, which can be installed for the customer.



The P-S Compartmentizer is proving to exert powerful control over the lading damage frequency and severity claims that cost railroads more than $111,000,000 a year. And this new device has ranged itself alongside the other Pullman-Standard lading damage prevention products—the Cushion Underframe and the Lading Strap Anchor—that are successfully safeguarding shipments all along the roads of the Great American Railway System.

The P-S Compartmentizer offers added benefits to railroads and shippers. Examples? Its two pairs of rugged steel gates can be used to lock in and segregate lading, preventing pilfering, mix-up and error. A consignment destined for City "A" can be handled without disturbing shipments to Cities "B" and "C". And the Compartmentizer speeds handling and protects lading for Full Car Load, LCL or Stop-off. Mobility of the gates allows positioning tight against the face of the load, reducing needs for costly dunnage. And the device allows many shippers to fill box cars to the roof for up to 15,000 lbs. added volume.

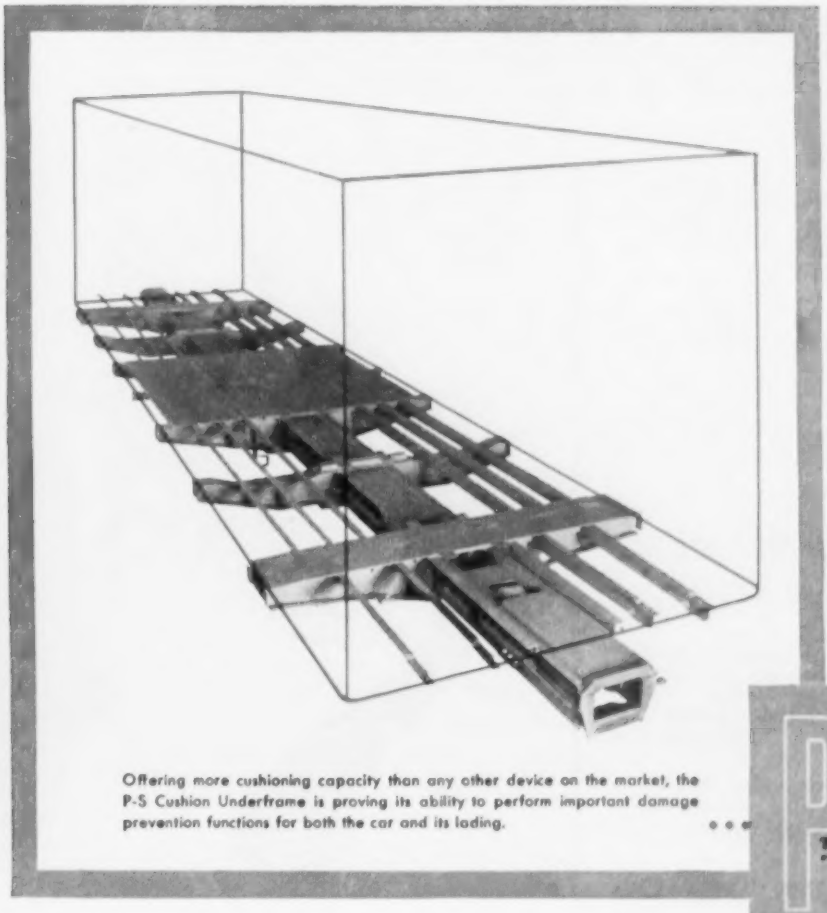
Thus, one of the P-S Compartmentizer's most outstanding advantages is its ability to earn shipper preference and build added freight traffic revenues.

Pullman-Standard has prepared detailed literature on the Compartmentizer. Write for your copies. A Sales Representative will call for a personal discussion, if you wish.

NOW

P-S Cushion Underframe

- **Protects *both* car and lading.**
- **Dampens shocks, even under "collision" impacts.**
- **Low cost and maintenance. Builds high revenue.**



Offering more cushioning capacity than any other device on the market, the P-S Cushion Underframe is proving its ability to perform important damage prevention functions for both the car and its lading.

The P-S Cushion Underframe is now serving or on order in 547 box cars on 10 lading damage prevention conscious roads of the Great American Railway System.

The Cushion Underframe is designed to utilize the sliding sill principle with a built-up rubber cushion mechanism at the center of the car. After conventional draft gears reach their capacity under about 5 mph impacts the Cushion Underframe takes over the shock dampening job. In-service and laboratory tests are proving the P-S Cushion Underframe gives important protection to both car and lading even at "collision" level impacts of up to 10 mph.

We would like to provide you with complete details on this important lading and rolling stock saving device. Write for informative literature. If you prefer, a qualified Sales Representative will call for a personal discussion.

YOUR NEEDS CREATE THE PULLMAN "STANDARD"

PULLMAN-STANDARD

CAR MANUFACTURING COMPANY

SUBSIDIARY OF PULLMAN INCORPORATED

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BIRMINGHAM, PITTSBURGH, NEW YORK, SAN FRANCISCO, WASHINGTON

JOY *Multi-Flex*
DIESEL CONTROL JUMPERS
ARE GUARANTEED
for 2 Long Years

27 to 27 Pole Multi-flex Diesel Jumper *(illus.)*

DATED for protection

Need we say more . . .

Why be misled by reports of tests that fail to simulate actual road conditions . . . or be influenced by unsupported promises of low maintenance costs? *All* JOY *multi-flex jumpers are guaranteed to provide at least two years of satisfactory maintenance-free service* . . . many are still in use after 4 or 5 years of service. If a mechanical or electrical defect develops in a JOY multi-flex jumper under normal operating conditions within two years, we'll replace it, without charge . . . and to make certain that this guarantee is faithfully fulfilled, each jumper is clearly dated when manufactured *(see illus.)*. Supplied in standard lengths for 27 or 21 wire circuits with silver-plated contacts, JOY diesel jumpers are ready for use when received.

only JOY *molded Neoprene Diesel Jumpers have all these features*

1. Trim, factory wired one-piece Neoprene assembly. *Completely eliminates incorrect circuit hookups — a condition that has occurred with shop-wired attachable heads.*
2. Watertight, Shatterproof and Vibration-resistant.
3. Silver plating protects contacts from corrosion and increases conductivity.
4. Protective hanging sleeves . . . can't be misplaced.
5. Multiple cable for maximum flexibility between plugs.
6. Positively reduce diesel shop maintenance costs.

JOY MANUFACTURING COMPANY
HENRY W. OLIVER BUILDING, PITTSBURGH 22, PENNSYLVANIA
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LTD., GALT, ONTARIO

Consult a JOY *Engineer*

for information on these products

- Plugs and Receptacles for Air Conditioning and Battery Charging Requirements
- Dynamic Brake and Electric Airbrake Jumpers and Receptacles
- Inter-car Communication Jumpers and Receptacles
- Rotary Sand Dryer Screeners

JOY

SINCE 1851 - OVER A HUNDRED YEARS OF ENGINEERING LEADERSHIP

CD 195.3

Pacemaker Freight Locomotives lubricated with **GULF DIESELMOTIVE OIL**

move merchandise at mile-a-minute clip

New York Central Pacemaker Freights have a successful record of fast, dependable deliveries that save shippers a full business day throughout New York, New England, and key Midwest cities.

Gulf Dieselmotive Oil, the modern Diesel lubricant that contributes to the superb performance of the powerful Diesel locomotives for these mile-a-minute freights, also has a successful record of dependable service—in many crack trains on U. S. railroads.

Here's how this top quality lubricant helps keep maintenance costs down, availability up:

1. Effective detergent action prevents harmful piston ring belt deposits.
2. Base stocks are selected for their ability to help prevent hard deposits on the piston crown and in the ring belt area.
3. 100% solvent refining (removing undesirable constituents) insures greater stability and better bearing protection.

Gulf Sales Engineers, experienced in railroad Diesel operation, are always available to aid you in maintaining high standards of lubrication throughout your system. Write, wire, or phone your nearest Gulf office today.

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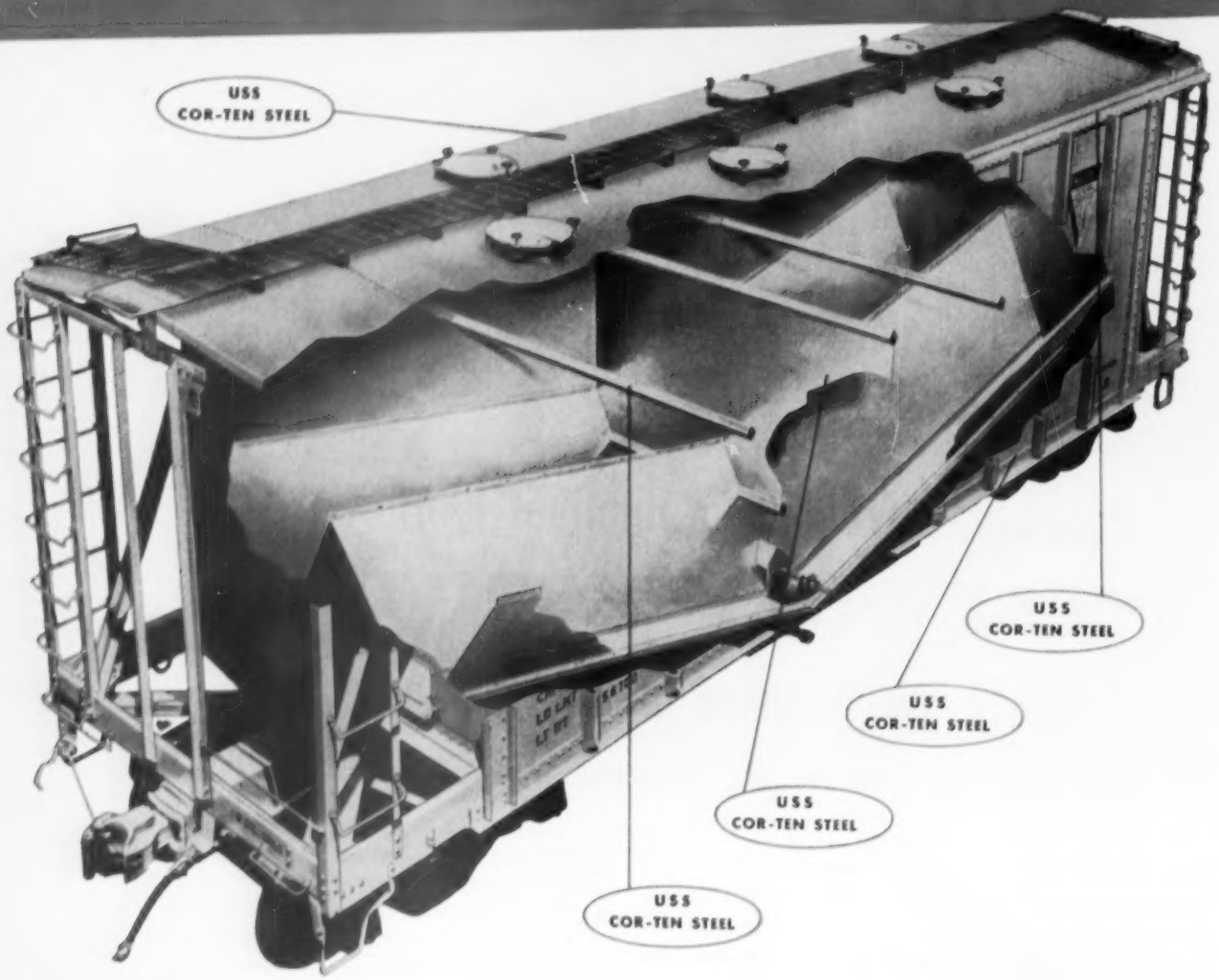
1822 GULF BUILDING, PITTSBURGH 30, PA.

USS HIGH STRENGTH STEELS
TWENTY-TWO YEARS OF PERFORMANCE

190,000 freight cars have been built



USS HIGH STRENGTH STEEL

better with USS COR-TEN Steel since 1933

In General American's new AIRSLIDE® cars

USS COR-TEN Steel

was selected to minimize corrosion and keep maintenance costs low

The increased demand by shippers of dry, granular, and powdered bulk materials for a special car that would protect the lading and be easier to unload has been answered by the General American Transportation Corporation, Chicago. It's the new AIRSLIDE Covered Hopper Car.

How well the AIRSLIDE car fills the bill can be deduced from the fact that since its introduction less than two years ago, more than 600 are today in service or on order.

Shippers who hitherto have not found bulk handling feasible are now using these cars and are realizing substantial savings in container, dunnage and labor costs. Improved sanitation and reduced damage from contamination are additional advantages these shippers appreciate.

To solve the difficult problem of high-speed unloading, the GATX engineers have utilized the Fuller* Airslide principle by which the lading is aerated and fluidized, causing it to flow like water to the double hopper doors.

They selected USS COR-TEN Steel for car construction for two reasons: (1) to obtain high strength with no increase in weight, and (2) to reduce interior corrosion, caused by condensation, to a minimum.

USS COR-TEN Steel's high yield point of 50,000 psi. and its high resistance to atmospheric corrosion, 4 to 6 times that of carbon steel, made it a logical choice on both counts.

COR-TEN Steel's high corrosion resistance plus the fact that paint adheres more tightly to it are further assurance that these AIRSLIDE cars will maintain their attractive appearance longer and will better resist the attack of atmospheric corrosion both inside and outside.

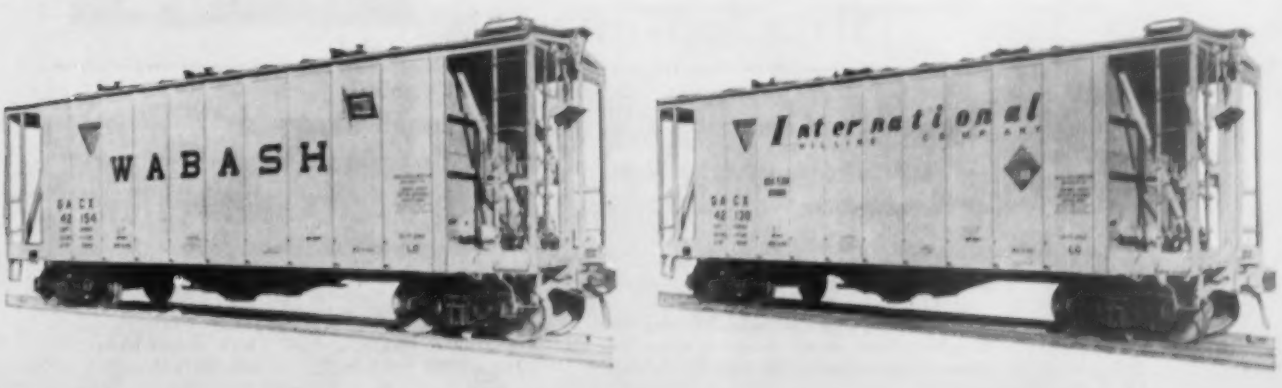
By combining a unique car design with superior COR-TEN Steel construction, the builders of the AIRSLIDE car have made available to shippers an efficient means for transporting commodities never successfully handled in bulk before—and a car that can be confidently counted on to render long time service with the least amount of maintenance.

Find out how readily USS COR-TEN High Strength Steel can be adapted to your designs. Our engineers who pioneered its application in freight equipment of every type can place at your disposal an unequalled experience in its use that cannot fail to be helpful. We welcome your inquiries, and the opportunity to work with you.

(*The Fuller Company: A subsidiary of General American Transportation Corporation.)

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—Consult your newspaper for time and station.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



UNITED STATES STEEL

Precision Parts by MAGNUS

mean LONGER, SAFER MILEAGE

for Diesel Locomotives

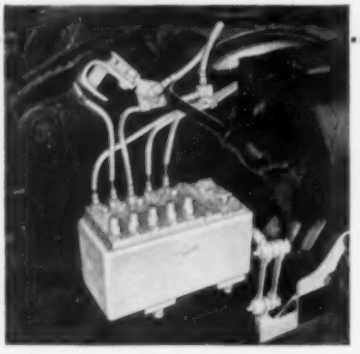
- *Perfectly mated bearing halves*
- *Heat-resistant Satco lining metal*
- *Interchangeable double keeway*
- *Available for all makes and types of diesel-electrics*

High Mileage

traction motor support bearings for LONGER ROAD LIFE

The extra precision that goes into Magnus traction motor support bearings pays off in longer, trouble-free mileage on the road. Quality control of metal mixes, high precision boring and final testing of mated bearing halves *under load* assure an extra margin of dependability — you can't buy a better bearing.

These Magnus HIGH-MILEAGE bearings are available for replacement on all types and makes of diesel-electric and electric locomotives and MU cars. For the complete facts, get your free copy of Bulletin No. 6000.



D-16 FLANGE LUBRICATOR increases mileage between wheel turnings up to 40%

This new, *more positive* method of flange lubrication not only gives greatly extended wheel life, but substantially reduces shop costs, too. Oil pressure to each flange is positively controlled by six individually adjustable pumps that are gang-operated from a common linkage to the truck frame. Unit operates only when locomotive is moving. Can be used to lubricate center pin wear plate also, if desired. Full 16-pint capacity for extra mileage between refills. Write for complete information.

MAGNUS 391 SAFETY VALVE

for dependable overload protection on diesel locomotive steam generators

This high-precision safety valve is specially made for railroad service on diesel locomotive steam generators. Opening and blowdown pressure adjustments are easily accessible and self-locking. Flexible metallic bellows prevent escape of steam into the generator compartment. Write for full details.

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Metal Corporation

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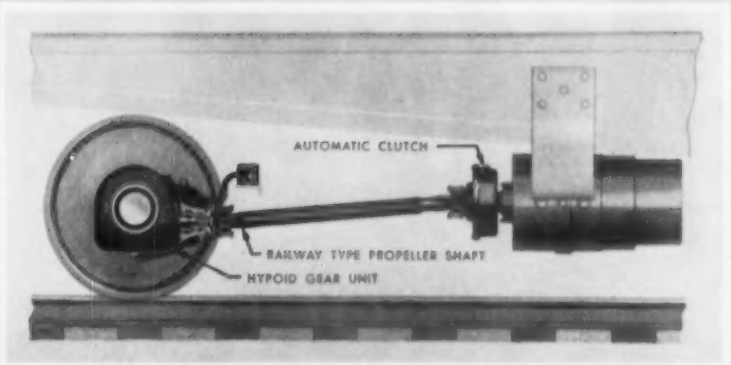
OVER 11,000



Spicer Railway Generator Drives

now in use by more than 70 railroads

– a record unequalled by any other similar unit!

Spicer

DANA CORPORATION • TOLEDO 1, OHIO

It's NEW..

SINCLAIR LITHIUM

ROLLER BEARING

AAR APPROVED

New – but already proven by hundreds of thousands of miles of service to be outstanding for car and locomotive roller bearing lubrication.

Sinclair Lithium "RB" Grease is a uniform smooth grease having superior mechanical stability.

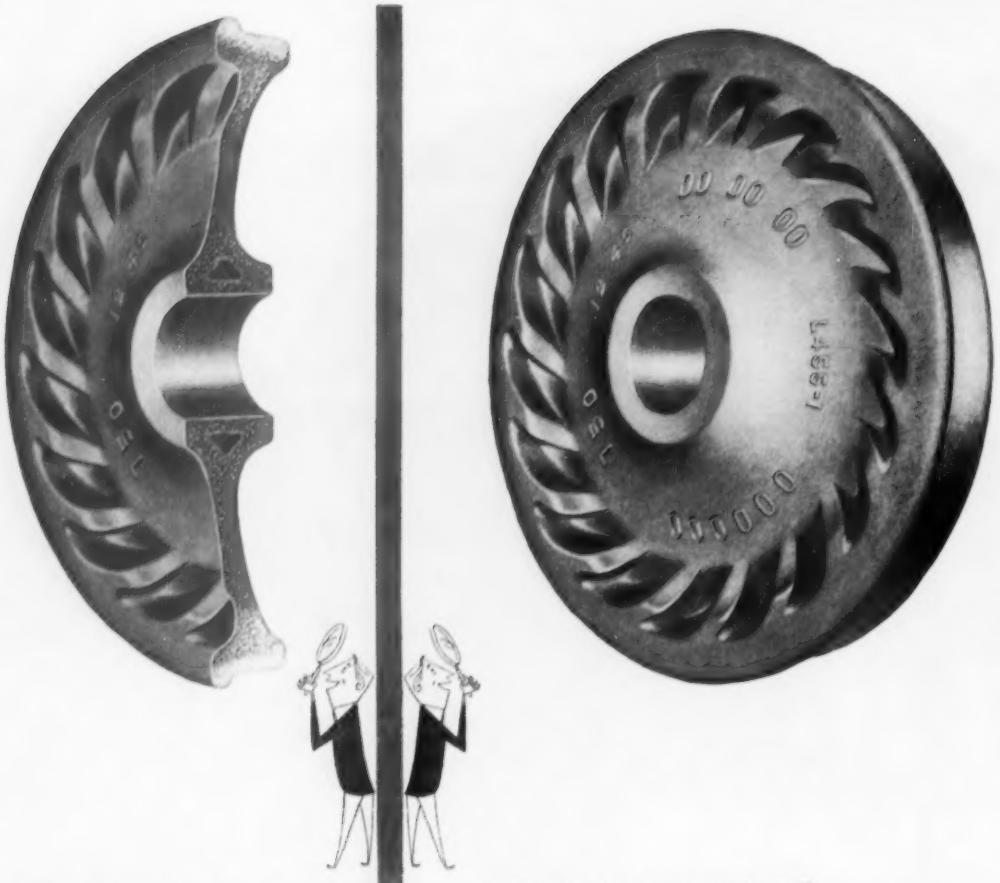
Sinclair Lithium "RB" Grease has excellent resistance to oxidation and is non-corrosive to bronze and other bearing materials.

Sturdy Sinclair Lithium "RB" Grease flows readily at low operating temperatures yet will not thin out at high operating temperatures or under heavy loads.

SINCLAIR RAILROAD LUBRICANTS

Sinclair Refining Company, Railway Sales, New York • Chicago • St. Louis • Houston

GREASE



any way you look at it– inside or out...

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NMB Sealed

"Patented" and "Patents Pending"

Eliminates 81.4%* of all hot boxes

and 100% of hot boxes due to waste packing.

- **GREATLY REDUCES** operating costs, eliminates virtually all accidents due to hot boxes.
- **PROVIDES** a modern scientific system of lubrication and dirt exclusion for solid bearing journal boxes.
- **SIMPLE,** inexpensive installation. Requires no change in present journal boxes.

Over three years ago, NMB research engineers began the search for a solution to railroad car hot boxes. Our 33 years of sealing experience indicated an answer could be achieved by eliminating waste packing and sealing the solid bearing journal box so the journal and bearing could operate in a constant lubricant bath.

First came development of a shaft seal to retain lubricant and exclude water, dirt and brine from the rear of the journal box. To insure complete sealing and trouble-free operation, other parts were needed and were developed. These parts comprise the NMB Sealed Journal Box Kit. The Kit may be installed in any standard solid bearing journal box quickly, without alteration.

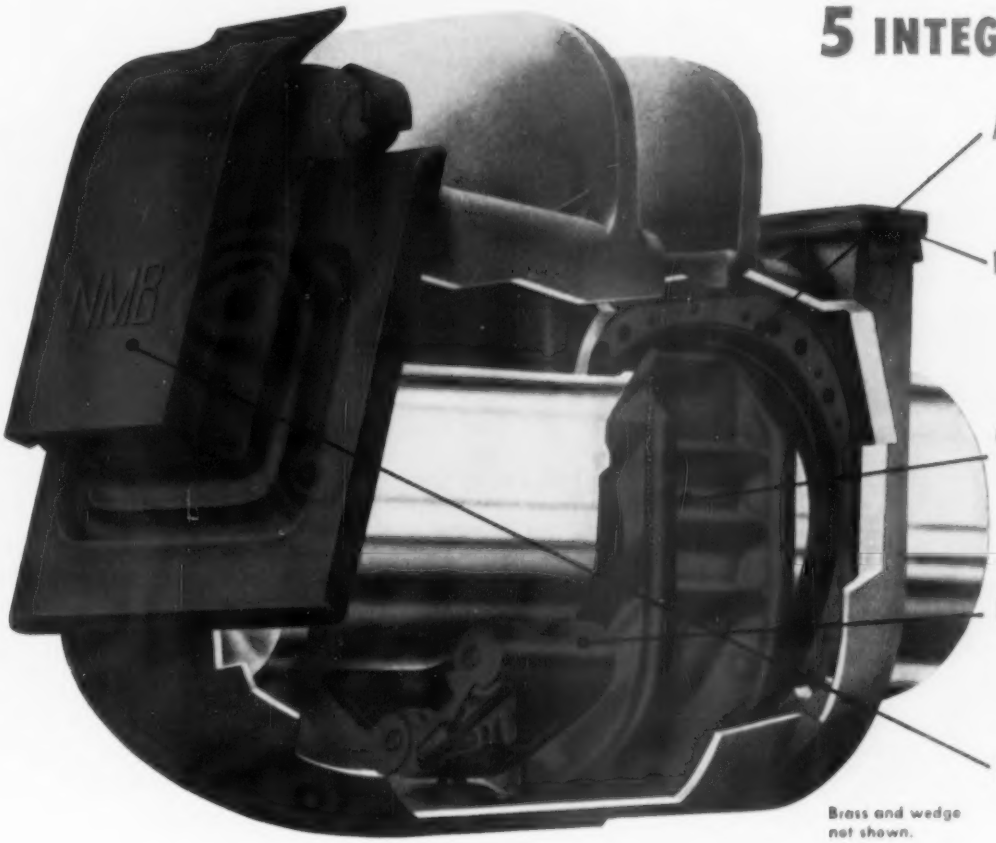
Performance has been truly remarkable. Experience shows the Kit can produce operating and maintenance savings of at least $6.88 per 1,000 car miles; an average of $116.96 per car per year.

NMB Kits have been tested continuously under all operating and weather conditions for the past three years. Initially, extensive tests were conducted on Union Pacific cars under supervision of Mr. David S. Neuhart, General Superintendent, Motive Power and Machinery, Union Pacific, and Chairman of the Mechanical Division. A.A.R., in collaboration with Mr. Lloyd A. Johnson, President of National Motor Bearing. Subsequently, tests were also conducted by the Southern Pacific under supervision of Mr. B. M. Brown, General Superintendent of Motive Power, and by the Western Pacific under supervision of Mr. E. T. Cuyler, Chief Mechanical Officer.

Today all three railroads have placed production orders for thousands of NMB Sealed Journal Box Kits. The railroads are installing Kits on box cars, piggy-back flats, and other cars where exceptional operating dependability is desired.

INTERCHANGE SERVICE ON 10,000 FREIGHT CARS

Journal Box Kit



Brass and wedge not shown.

5 INTEGRATED PARTS

A. OIL SEAL
Seals lubricant in, seals dust, dirt, water, brine and snow out.

B. DUST GUARD WELL COVER AND FILTER
Excludes dripping water, snow and brine, yet permits breathing of sealed box.

C. JOURNAL GUARD BEARINGS
Cushions journal box assembly against coupling, starting and braking shocks.

D. OIL CIRCULATOR
Constantly delivers large volume of oil to bearings; bearings and journal run 50° cooler.

E. JOURNAL BOX LID
Pressure-tight seal keeps oil in, dirt and water out.

Besides the NMB Kit for solid bearing freight cars, National has made thousands of oil seals for roller bearing railway cars, and over a billion oil seals for America's CARS • TRUCKS • TRACTORS • AIRCRAFT • MACHINES • APPLIANCES

NATIONAL MOTOR BEARING CO., INC.

GENERAL OFFICES: Redwood City, California
PLANTS: Redwood City, Downey and Long Beach, California; Van Wert, Ohio

RAILWAY DIVISION DISTRICT OFFICE:
4113 Field Building, 135 S. La Salle Street, Chicago, Illinois

*Based on operating statistics of major Class 1 railroads.

READ MORE ABOUT KIT

NMB KIT proved in over 7,000,000 journal box miles

A. A. R. APPROVED FOR INTERCHANGE SERVICE ON 10,000 CARS

In Union Pacific, Southern Pacific and Western Pacific cars, the NMB Kit has now accumulated over 7,000,000 journal box miles under the most demanding operating conditions. **Operation is so dependable journal boxes equipped with the Kit are inspected only once each 30 days!** Railroad mechanical engineers and motive power superintendents say the following are some of the benefits railroads will realize from NMB Kits:

FAST, SIMPLE INSTALLATION without journal box alteration

1. Journal box is thoroughly cleaned. Locating washer for oil circulator is welded to bottom of box.

2. NMB Oil Seals are placed in dust guard well and side frame is pushed into position on the journals.

3. One guard bearing is inserted on each side of axle, with rubber bearing surface facing axle.

4. After mesh filter is placed in dust guard slot, dust slot cover is snapped into place.

5. Oil circulator is placed in position, and its pedestal installed through opening in locating washer.

6. Installation of NMB journal box lid is quick, simple, actually easier than conventional lids.

ELIMINATE MOST HOT BOXES An estimated 81.4%* of hot boxes are caused by waste packing, poor lubrication, or related causes. No waste packing is used in journal boxes equipped with NMB Kits. ALL HOT-BOXES CAUSED BY WASTE ARE ELIMINATED.

ELIMINATE REPACKING An annual saving averaging $17.10 per freight car per year.

90% LESS LUBRICATING OIL A major Western railroad spends $317,000.00 annually for journal box lubricating oil. Cars equipped with the NMB Kit use only 10% of normal oil requirement.

90% LESS INSPECTION A typical Class 1 railroad spends $2.70 per 1,000 car miles for oiler and inspector labor. Experience shows this cost can be cut to 27c with the NMB Kit.

LONGER JOURNAL AND BEARING LIFE A film lubricant is constantly maintained, and bearing end wear is practically nil.

ELIMINATE VIRTUALLY ALL ACCIDENTS CAUSED BY HOT BOXES!

An informative booklet on the NMB Kit, prepared specifically for mechanical and operating officials of American railroads, will be sent on request.

NATIONAL MOTOR BEARING CO., INC.

GENERAL OFFICES: Redwood City, California
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are installed in new

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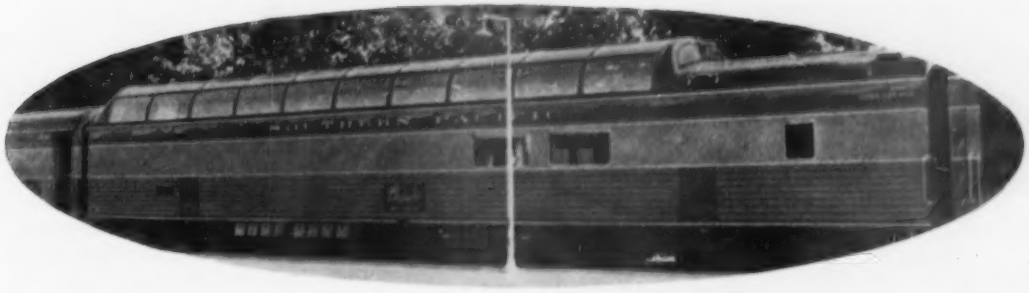

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- Air tight seal and patented "breather" device assure passengers of unimpaired visibility.
- No maintenance required except routine washing.
- Broken panes can be replaced in yards.

Let your passengers *see* the scenery you advertise...through Adlake "Breather" Windows!
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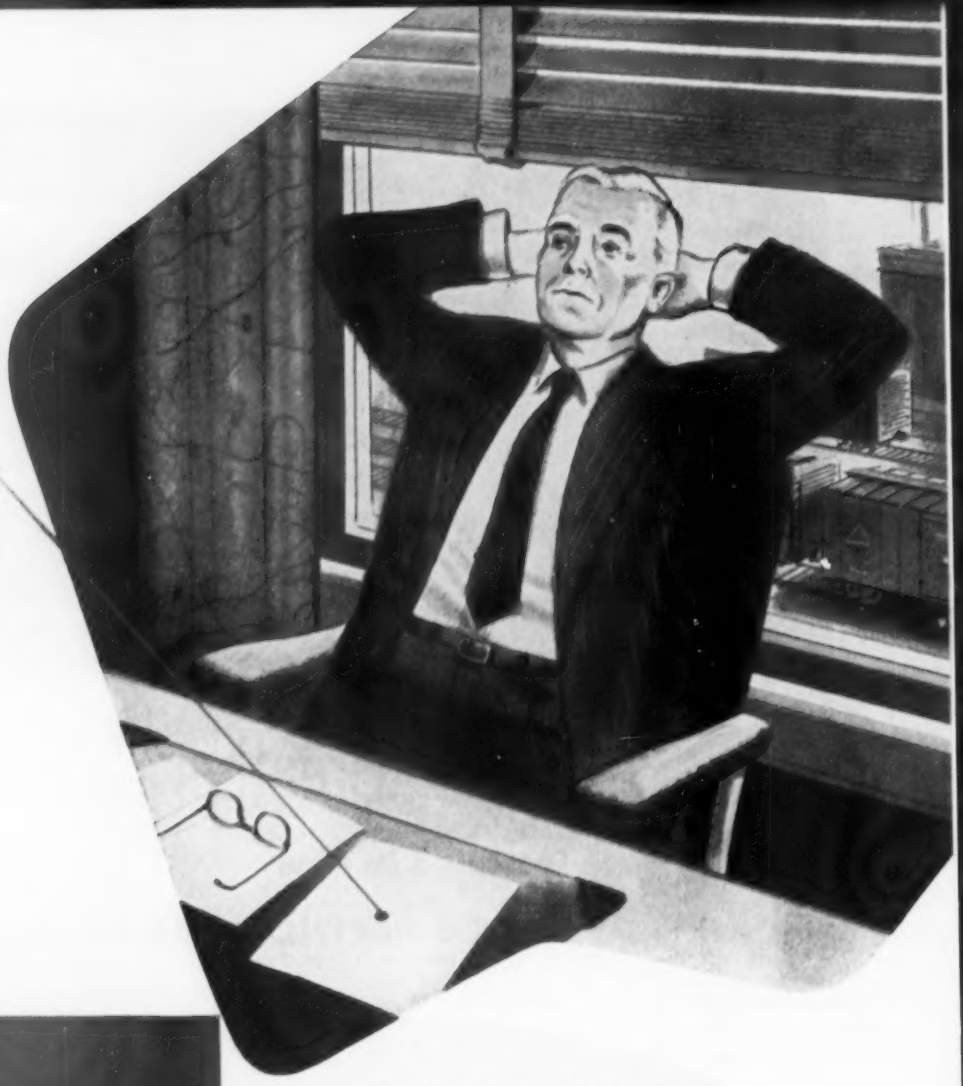
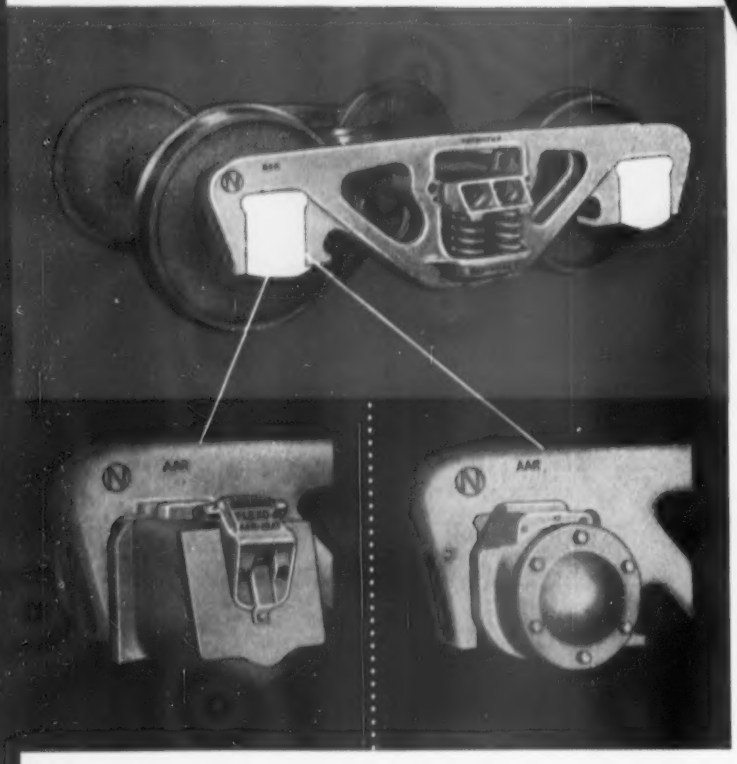
MEMO



To those contemplating future purchase of roller bearing freight trucks



Should you be considering roller-bearing freight trucks but feel the investment cannot be made at this time—the National C-1 truck with "jaw-construction" may be the answer to your dilemma. Here's why:

You can order new cars *now*, equipped with C-1 trucks and National Journal Boxes with jig-ground lid faces. Then when you upgrade your cars to roller bearings in the future, these solid-bearing boxes can be replaced with new roller assemblies.

Meantime you get all the superior riding qualities of National C-1 trucks . . . all the extra protection to equipment and lading . . . all the extra-low maintenance because friction wedges in C-1 trucks have full-width bearing in side frame pockets.

Think of tomorrow *today*—and spread your investment in modern roller-freight trucks with jaw-construction National C-1 trucks.

Circular 5654 "Facts About the C-1 Truck" available on request.

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EDITORIALS

The Boiler Makers Adjourn

It is with deep regret that we record the passing of the Master Boiler Makers Association as an independent organization after having served the railroad industry for almost 53 years. Because of the evolution from steam to diesel power, the association, which came into being in November 1902, found itself in a position, through loss of membership and economic considerations, where it could not continue.

On March 11 this year, two members of the Boiler Makers Executive Committee appeared before a meeting of the Coordinated Mechanical Committee at Chicago to outline the association's difficulties and recommend disbandment. Immediately thereupon, the Executive Committee of the Locomotive Maintenance Officers Association extended an invitation to the membership of the Boiler Makers Association to join its ranks and revised its program to include a session which the Boiler Makers can attend as a separate group.

No announcement of this kind would be complete without paying tribute to the man who has been the motivating force behind the association since 1930—Al Stiglmeier. By force of personality and seemingly inexhaustible energy, Al kept the Boiler Makers together during depression years and to the point where the passing of the steam locomotive curtailed the activities of the association.

Where Do You Find Out?

In a recent issue of this magazine, we quoted an electrical engineer as having said, "You could have the whole damn mechanical department on one of our passenger trains and if the locomotive broke down, the first thing they would do would be to send for an electrician." It was suggested that the supervisor who, in most cases, has come up through the mechanical department should know something about things electrical and that if he does, he should at least be able to diagnose the trouble before the electrician arrives.

One basic difficulty is that many mechanically trained men seem to suffer from a mental block when they approach an electrical problem. Perhaps another difficulty involves a matter of protocol. The electrical department has long run errands for both the mechanical and engineering departments, and the mechanical department man may feel that his position is made more secure if he avoids any possibility of disclosing his lack of technical knowledge and insists on the services of the electrician—lets him make the mistakes, if any. On the other hand, in the earlier days, when applications of electrical equipment were few, the electrician sought to emphasize his importance by making a mystery of the things he did.

This situation is one which cannot continue. Things mechanical and electrical are so interdependent that not only the superintendent, but also the supervisors and the maintainers must know the job from both ends, even though they themselves are specialists.

There are many places to find out what you need to know. The builders' schools explain all the details of their locomotives. They show how to run them and how to find and remedy trouble when it occurs.

The railroad schools, abetted by instruction cars, carry the work a little farther. The builders teach perhaps ten per cent of the railroad staff, and the railroad schools extend it to everyone who needs to know. They deal specifically with equipment used by that railroad and with that railroad's operating requirements.

The diesel clubs around the country really get down to cases. Among other things, they bring the railroad operators in contact with suppliers' representatives where the latter get a going over which can be survived only by a rugged individual. This somewhat rough, but effective, procedure has done much to improve equipment and to increase the operator's understanding of how to use it.

Eventually every good man wants to know why as well as how. An excellent source of such information is the "How to Keep 'Em Rolling" series, now available in book form. In simple language, it explains the reasons why electrical equipment performs as it does and tells why definite operating practices are necessary. It has saved many a man the embarrassment of asking a question for which he should know the answer. Most important, it is fundamental to all makes and kinds of locomotives and will never go out of date.

Engineering and design, and studies of such subjects as flashovers and wheelslip, are handled in a practical manner by the Land Transportation Committee of the American Institute of Electrical Engineers. Membership in this organization provides an opportunity for one to round out his knowledge of diesel and other electrical equipment used in transportation service.

Finally, membership in the Electrical Section, Association of American Railroads, is a must for every railroad man who has an interest in the development of standards and recommended practices, and who wants to keep in contact with the men in his position on other roads. Committee work is equally beneficial to the railroads and to the men preparing the reports.

This magazine will keep you in touch with current developments. It will also help you with everyday work and will keep you informed on what other railroads are doing. The "How to Keep 'Em Rolling" series will be supplemented by a second series to be called, "Roll Them Out Like New." This will take you into both the railroad shops and the outside service shops.

Until quite recently, information on diesel electrical equipment was scarce and something less than top quality. There are, of course, other sources than those here described. The point is that it is now available, and he who wants it may have it in almost any form which suits his particular requirements.

Destined to make an outstanding record

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New CINCINNATI HYPOWERMATICS are the world's finest heavy duty automatic milling machines . . . they are worthy of the immediate attention of your replacement committee. ¶ These new machines are built in 42 sizes, plain and duplex styles, 36" to 168" table traverse, up to 50 hp drive. Outstanding time and effort saving features include Dynapoise overarm, Hydramech table drive, backlash eliminator, automatic spindle stop. More details in catalog No. M-1871. Write for your copy today.

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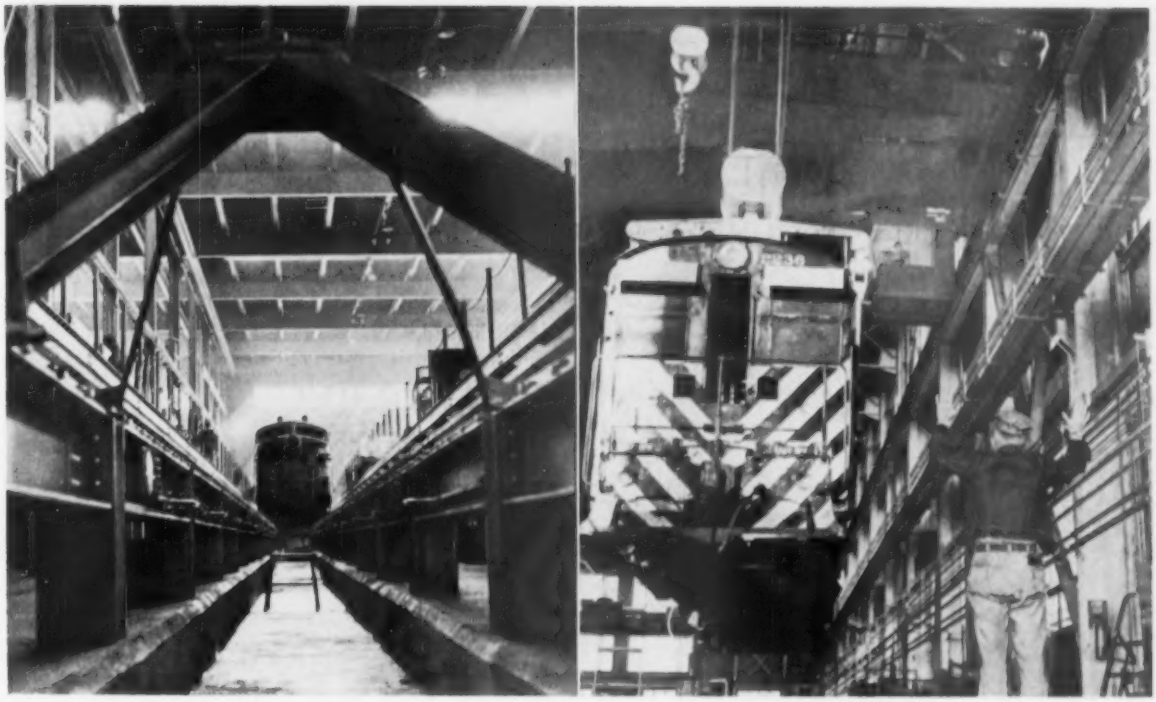


WORM'S EYE VIEW (LEFT) of road freight diesel entering the big new Argentine shop—Two Whiting cranes carry 244,500 lb. of locomotive (right)

Pooled Service . . .

The Secret of Santa Fe Success . . .

With Diesel Power

How new diesel shop facilities at Argentine, Kan. help in general running maintenance program.

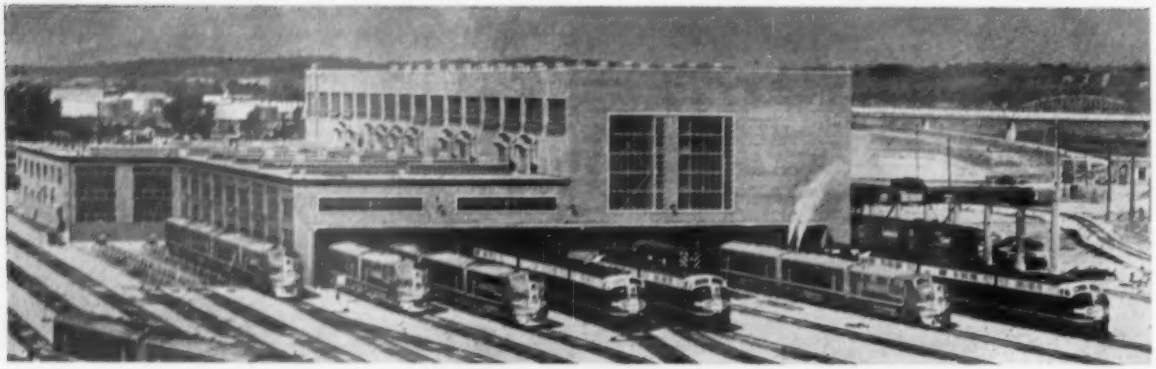
Any real appreciation of the important part played by the big, new diesel maintenance shop and terminal of the Santa Fe at Argentine (Kansas City), Kan., is contingent upon understanding how effectively this completely dieselized major Class 1 railroad has succeeded in pooling its inventory of diesel-type motive power.

Passenger locomotives are operated in two pools protecting all service for the system. The large transcontinental passenger pool operating between Los Angeles-Chicago-Galveston (Tex.) consists of 219 units with maintenance centered primarily at Barstow, Cal. The second passenger pool of 20 units operates out of Chicago to Oklahoma City, Dallas, Tex., and Paris, with maintenance centered at Chicago.

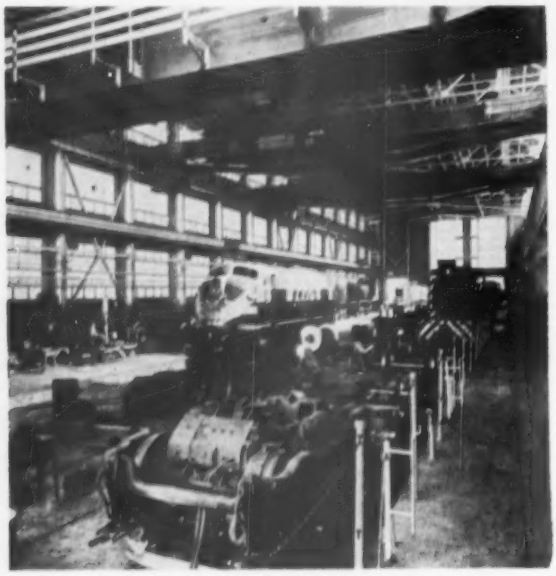
Freight locomotives are operated primarily in five pools. One, known as the Barstow Pool, consists of 324 Type F7 units operating between Barstow-Belen (N.M.)-Clovis (N.M.)-Waynoka (Okla.) with running maintenance centered at Barstow and heavy maintenance at San Bernardino, Cal.

The second, the Cleburne (Tex.)-Argentine (Kansas City)-Corwith (Chicago) Pool, consists of 357 units. This pool also handles main-line freight business between Chicago-Waynoka and Chicago-Denver-Amarillo-Clovis-Sweetwater (Tex.), with running maintenance centered at Argentine and Cleburne and heavy maintenance at Cleburne.

The third pool consists of road-type switchers operating south of Cleburne to Silsbee and Galveston, and west to Sweetwater. There are 90 units in this pool with all maintenance centered at Cleburne. The two other freight pools cover the territory north of Bakersfield, Cal., and



LOW BAY (LEFT) is for running maintenance and high bay (right) for annual inspections



HIGH-BAY AREA where annual inspections are made

LOW-BAY AREA especially equipped for running repairs

south of San Bernardino, and each comprises some 41 road-type switchers with running maintenance centered at Richmond, Cal., Bakersfield and San Bernardino, and with heavy maintenance at San Bernardino.

Diesel power for all other relatively short territories, which also consists of road-type switcher units, has running maintenance centered at the various terminals where the locomotives are assigned, with heavy maintenance handled at the closest large shop.

This system pooling of power permits the majority of all running repairs covering routine maintenance, mileage, and form-inspection work, to be handled at three points; namely, Barstow, Cleburne and Argentine. Road-type switchers and yard engines receive their running maintenance at division points where assigned. Heavy repair work, with minor exceptions, is all handled at the two main shopping points, San Bernardino and Cleburne.

Improvements at Argentine

To strengthen its running maintenance facilities for the Cleburne-Argentine-Corwith pool the Santa Fe has constructed at Argentine what is said to be one of the most modern diesel servicing and repair shops in America.

Featuring a large bay for annual inspections, a running repair bay for routine semi-monthly, monthly, quarterly and semi-annual inspections, a cleaning room, machine shop area, storehouse facilities and offices, the main structure of the new shop is a two-story building constructed of concrete and brick, covering an area approximately 400 by 238 ft servicing facilities and feed tracks, including a balloon track which circles the shop building, complete the new installation.

For annual inspection work, the large bay of the new shop contains three tracks with full-length inspection pits on 30-ft. centers, allowing plenty of room for working diesel units between the tracks. One track contains a two-level ramp for handling repairs to all types of diesel locomotives. The bay, 400 ft long by 100 ft wide, is used for annual inspections on 130 to 150 switch engines and road-type switch engines as well as seven passenger engines. All wheel work for freight engines is handled in this area. Three Whiting cranes include two 125-ton with 30-ton auxiliaries and one 15-ton crane with 5-ton auxiliary which service the entire room.

The two 125-ton cranes are capable of picking up an entire locomotive unit and moving it to any desired point

in the shop area over the tops of the other locomotives. Some converted steam locomotive shops have comparable crane capacity but this is reportedly the first time a railroad diesel shop has been equipped to lift complete locomotive units.

There are four stalls with pit tracks inside the building in the running repair bay where semi-monthly, monthly, quarterly and semi-annual inspections are preformed on approximately 400 diesel units. Each of the two pairs of pit tracks is serviced by a 5-ton overhead tram-beam hoist. In addition, two stalls outside the building are equipped with ramps for overflow running repair work.

One of the inside stalls has a two-level ramp for switch and road switch engines, and all stalls are equipped with lubricating oil supply and drain lines, clear water lines, treated water lines for cooling systems, power tool electrical outlets, and air lines. All lines are color coded.

Fluorescent lights are under all ramps and pit lights are so arranged that all lights for any stall can be used at one time, or any section can be used individually. Controls for the lights are located under the ramps and at control button stations at each end.

Both the large bay and the running repair bay are equipped with radiant floor hot water heat. The entire building is equipped with low pressure steam radiators and de-icer radiators are in the bay areas for thawing snow and ice from the locomotives in winter time.

Removal of exhaust gases from the inspection bays presented a serious problem to engineers designing the shop. Blowers in the ceiling were not considered practical by themselves because of the type of heating system planned.

Exhaust gases rise when hot and settle again as they cool, and it was decided to take advantage of the rising gases for their expulsion. Fresh air intakes were placed at intervals along the side walls of the shop at a height approximately that of a locomotive, and ceiling fans were installed. The net result of this arrangement is that fresh air from the intakes comes into the building below the exhaust gases as they rise and carries them to the fans above. The air at floor level remains relatively still and is not contaminated. Called a "restricted circulation system," the plan is said to be the most advanced method of air purification in American industry.

Reconditioning of pistons, liners, rods, injectors, fuel pumps, governors, cooling fans, traction motor blowers, water pumps, lubricating oil pumps and all miscellaneous small parts pertaining to the operation of a diesel locomotive is accomplished inside the small parts shop area. Electrical parts such as contactors, relays, train control governors, train stop receivers, etc., are also repaired and rebuilt in this shop.

Offices Air-Conditioned

The master mechanic's offices, located on the second floor of the shop building, are well lighted and provide his staff with a modern, comfortable atmosphere in which to work. His and the general foreman's staff's are located here and handle all correspondence pertaining to the shop operation. The offices are completely air conditioned.

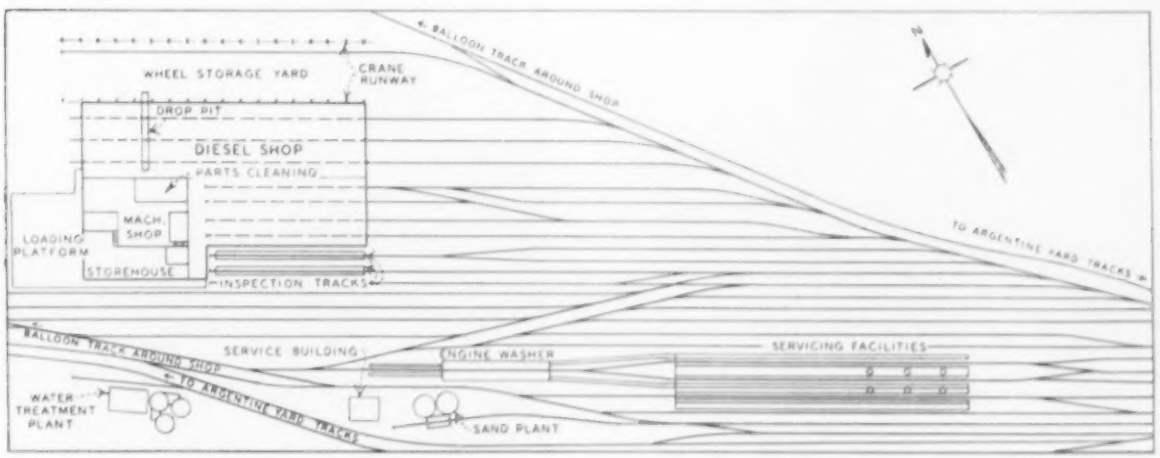
Also on the second floor is a large locker room containing a section with tables for lunch-time use by employees. The stores department maintains a storeroom on this floor where all heavy parts are kept for repairs needed during annual inspection work on diesel locomotives. Serviced by two elevators, the storeroom is approximately 92 by 100.

Store department offices are on the first floor along with running repair facilities, where all small parts for daily and routine running repairs are handled.

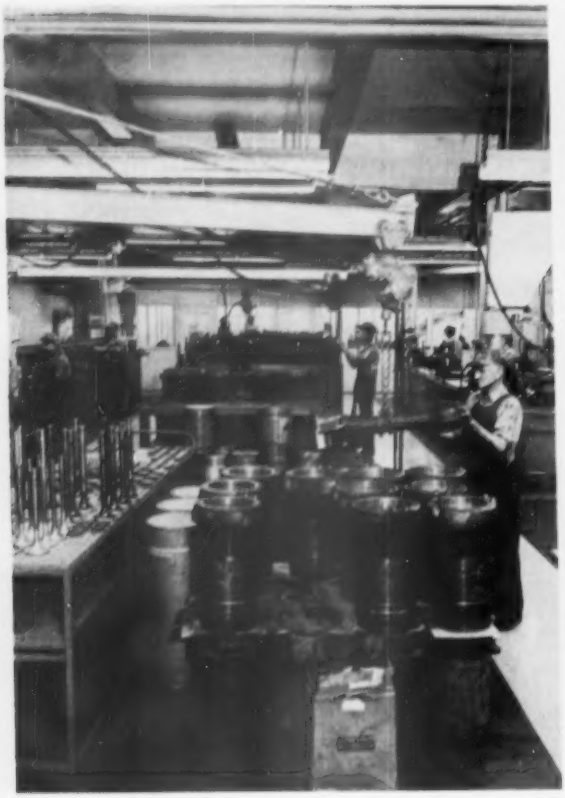
The diesel shop office force is housed in two air-conditioned offices on the first floor. Here it is that engines are dispatched and all records pertaining to inspections and repairs are kept. The nerve center for the communications system is housed in the office, and time cards are prepared and filed here.

Engine parts and filters are cleaned in the cleaning room located next to the small parts section. For running repair work approximately 70 lubricating oil filters are cleaned and repacked each day and 400 engine and carbody filters are cleaned, dipped and spun dry. The cleaning section is equipped with tanks for cleaning pistons, heads, liners and small engine parts and with a Farr filter cleaning machine.

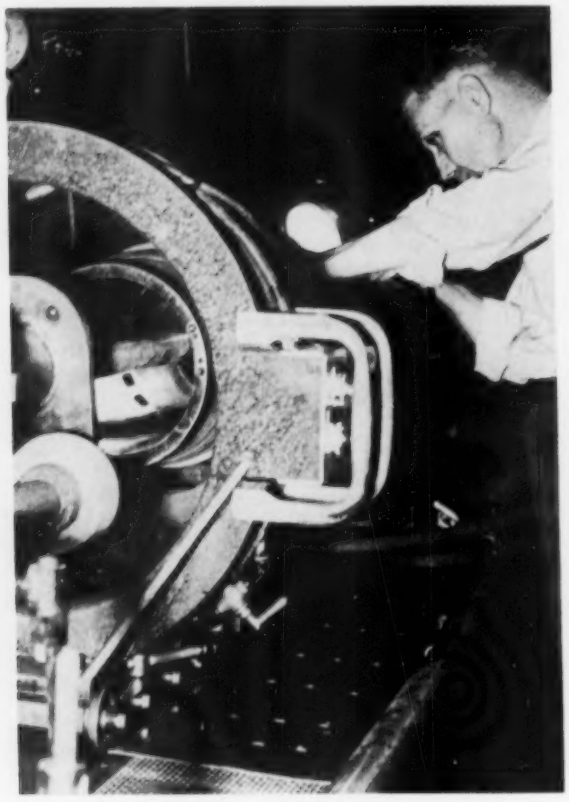
Outside the main building alongside the large bay area is an outside crane section approximately 80 by 425 ft in size. Serviced its entire length by a 30-ton 5-ton crane,



NEW ARGENTINE DIESEL FACILITIES include a shop, 16-track storage and ready yard and a 3-track servicing station



ENGINE DETAIL PARTS are reconditioned in this department which has 500-lb. hoists on jib cranes for handling heavy materials



MAGNAGLO INSPECTION UNIT used to check liners, heads, rods, pistons, etc., for possible defects

the area is used for loading and unloading wheels, traction motors, generators, etc., from freight cars, and also serves as a wheel storage area. Improvements to this area are planned in the future.

Servicing Facilities

All locomotives arriving at Argentine are serviced by the facilities adjacent to the main shop building. Sand towers, truck spray, fuel rack and washing machine are aligned for progressive operations.

The first stop is at the sand towers. Six sand towers (three for each of the two service tracks) have a capacity of ten tons of sand each. The sand flows from the towers by gravity through hoses into the locomotive sand boxes.

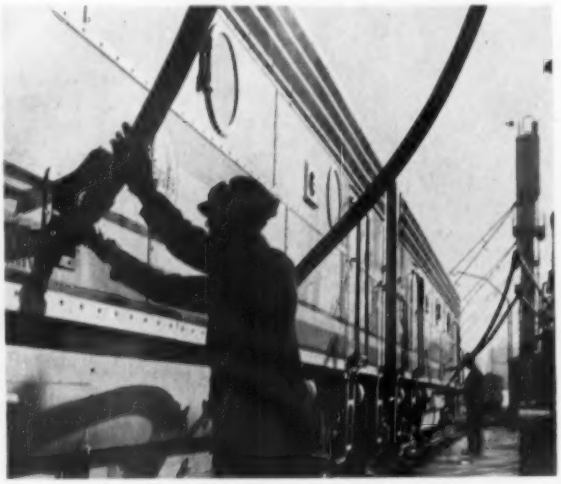
After sanding, locomotives move through the automatic truck spray where cleaning solution is applied to the trucks. The solution is allowed to remain on the trucks for from 10 to 15 min while refueling takes place, in order to dissolve grease and road grime from the undercarriage.

At the fuel rack, fuel and lubricating oil are replenished, and the steam generator water-supply tanks filled. Each unit receives up to 1,200 gal of fuel and up to 1,800 gal of de-mineralized water. Engine rooms are cleaned, brakes adjusted and miscellaneous inspection work is performed here.

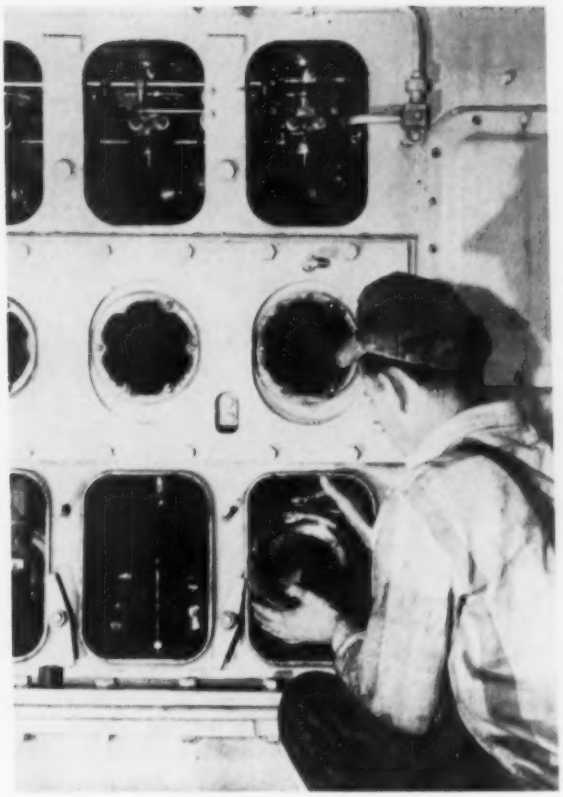
Trucks are rinsed with a water spray under 300 lb pressure to remove the cleaning solution, and the locomotive moves into the Whiting washing machine where rotary brushes wash the carbody proper. A final rinsing with water and the locomotive is again ready for road service.

Eastbound single-cab locomotives proceed around the balloon track to head them in the proper direction, and westbound units are switched to the parking area north of the fuel rack, eliminating much unnecessary handling in placing locomotives on the ready track.

About 650 tons of sand, 1¾ million gallons of fuel



REFUELING STATION where water tanks are also filled



INSTALLING PISTON in the engine of a Fairbanks-Morse diesel switcher—these pistons are removed and overhauled every two years

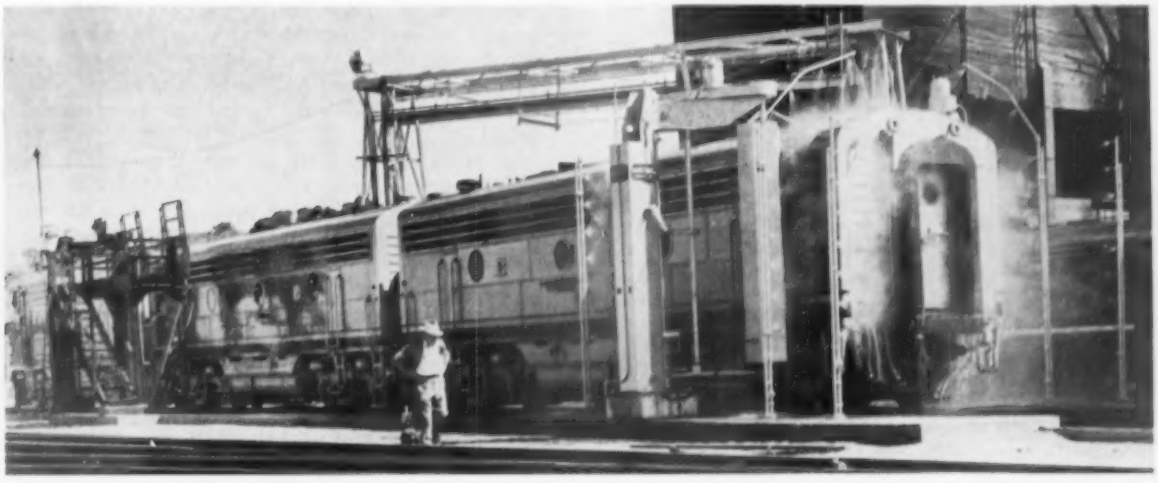
REPLACEABLE MICHIANA FILTER SOCK being applied before placing filter in storage rack at left

and between 40 and 60 thousand gallons of lubricating oil are distributed by these facilities each month. From 140 to 180 diesel units are serviced each 24 hours, or an average of approximately one every 10 min around the clock.

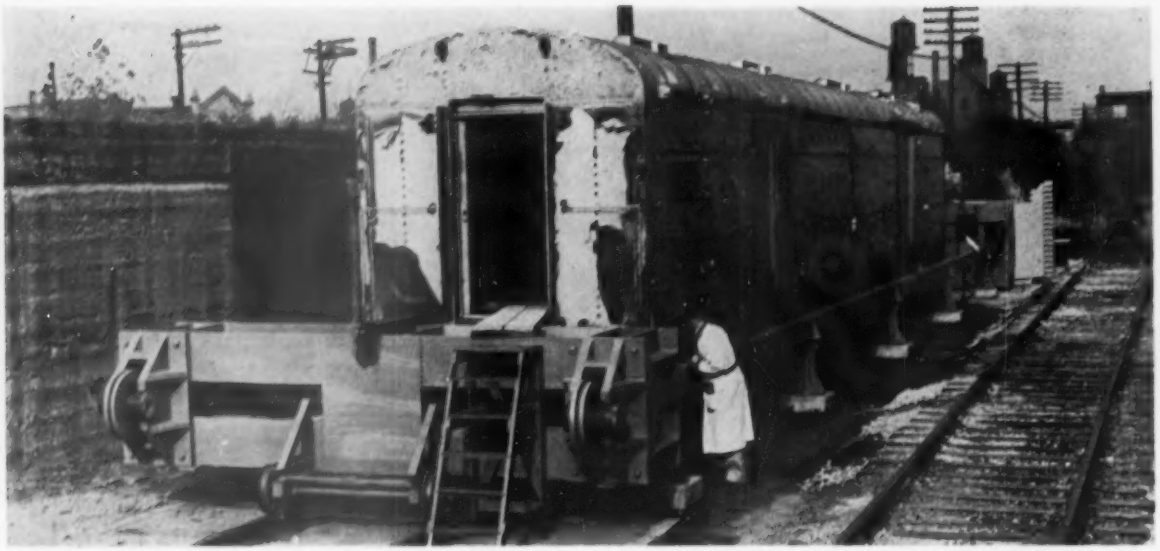
High pressure pumps for the truck spray in the servicing area as well as pumps for cleaning solution, water and lubricating oil distribution are housed in the service building located near the service area. Fuel oil, stored in underground tanks, is pumped to the fuel rack as needed.

Air compressors for maintaining pressure in air hoses throughout the shop area are in the power house near the main shop building.

All sections of the shop and servicing areas are reached by an intercommunication system, which is arranged to allow direct contact with the railway's main switchboard at Argentine.



WHITING LOCOMOTIVE WASHING UNIT as installed at the Argentine diesel servicing track



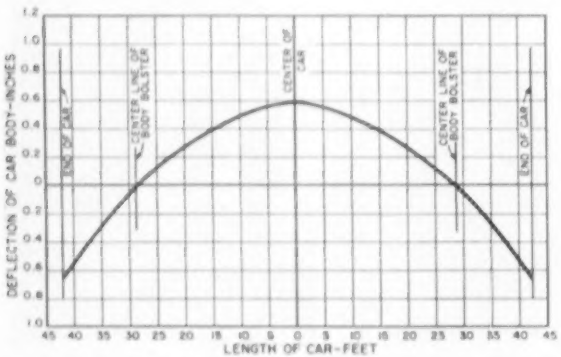
Compression test machine from the beam end—Santa Fe baggage car being tested.

Squeeze Tests on ACF Cars

Full test requirements met by stainless-steel baggage car for the Santa Fe and aluminum dome-coach for the UP

The passenger-car, compression-test machine* installed at the Association of American Railroads Research Center, Chicago, was used for the first time August 17 in testing a Union Pacific 85-ft dome-coach with aluminum-alloy superstructure, built at the St. Charles, Mo., shops of ACF Industries, Inc. The second car, put through the test machine on November 11, was a Santa Fe 74-ft stainless-steel-sheathed baggage car, constructed at the Berwick, Pa., plant of the same builder. Both cars withstood over 800,000 lb end pressure with deflections well within AAR limits, practically no permanent set and no signs of distress in the car structures.

* A million-pound machine formerly owned and used by the Pennsylvania at its Altoona test plant.



Longitudinal compression test of UP aluminum dome-coach built by ACF Industries

For both tests, the cars were received at the AAR research laboratory in skeleton form, the dome-coach being loaded with 82,440 lb of sand in bags and the baggage car with 21,960 lb to compensate for interior trim fittings and under-car equipment. After placing each car in the test machine, longitudinal pressures applied on the center sill end at the back follower stop, were recorded in pounds as calculated from a hydraulic pressure gage. Car body deflections at the center with respect to the body bolsters were measured by means of wire and mirror gages, side sheet buckles being measured with a dial gage and inside-width variations were carefully checked.

Test procedures for both cars were the same. The test in each case was started with a load of 132,536 lb pressure applied against the rear draft gear stop and continued in progressive steps until a total of 17 tests were made with a final load of 839,396 lb. Each test was started at zero after the load of the preceding test was released. Car body deflections over the entire load range were recorded and subsequently shown in tabular and chart form, as illustrated.

In the case of the UP aluminum dome-coach it will be noted that the average deflection between body bolsters on the maximum load of 839,396 lb was 0.60 inches which is well within the limit of 1.00 in. at 800,000 lb as required by the AAR Specifications shown on page

C-49-1946 of the Manual of Standard and Recommended Practices.

References to the right or left side represents the side of the car viewed by facing the car from the press end of the test machine. The vestibule or B-end of the car was located at the press end of the machine during the test.

Observations were made under, outside and inside the car during the progress of the test. No defects were found under the car on the center sill or draft gear stops either during the test or on examination of these parts after the test was completed. Buckling of side sheets, which ranged from 3/8 in. to 3/4 in. in a span of 36 in. while the maximum load was applied, mostly disappeared when the load was released. No permanent set of any consequence developed during the test.

On the basis of results observed, the official report states that this car satisfactorily meets AAR test requirements for buffing strength.

Compression test of the Santa Fe baggage car showed an average deflection between body bolsters of 0.40 in. at the maximum load of 839,396 lb which may be compared with 0.60 for the somewhat longer dome-lounge car.

Observations made during the test showed no defects under the car or on the center sill or draft gear stops. Buckling of the side sheets ranged from 7/32 in. to 3/8 in. in a span of 36 in. while the maximum load was applied and mostly disappeared when the load was released. A slight buckling was noted inside the car during maximum load with slight permanent deformation when load was released.

There were no appreciable permanent deformations either inside or outside of the car.

The test report showed that this car also has adequate buffing strength to meet the AAR test requirements.

DEFLECTION OF UP DOME-COACH CAR BODY UNDER COMPRESSION LOAD, IN.

Test No.	Pressure, lb., as calculated from hydraulic pressure gage	Beam end of test machine at center line of body bolster at stub end of car		At center of car		Press end of test machine at center line of body bolster at vestibule end of car		Av. amount of deflection between body bolster
		Right side	Left side	Right side	Left side	Right side	Left side	
1	132,536	.08	.10	.16	.18	.08	.10	.080
2	176,715	.10	.12	.24	.22	.12	.12	.115
3	220,894	.14	.14	.30	.28	.14	.14	.150
4	265,073	.16	.18	.34	.36	.20	.18	.170
5	309,251	.20	.22	.42	.42	.20	.22	.210
6	353,430	.22	.24	.48	.48	.24	.26	.240
7	397,609	.26	.28	.54	.54	.28	.28	.265
8	441,789	.30	.32	.60	.62	.32	.32	.295
9	485,966	.34	.36	.68	.68	.34	.36	.330
10	530,145	.36	.40	.74	.76	.38	.40	.365
11	574,323	.40	.42	.82	.82	.40	.42	.410
12	618,502	.46	.48	.92	.92	.48	.48	.445
13	662,681	.48	.52	.98	.98	.52	.52	.470
14	706,860	.54	.56	1.04	1.06	.54	.56	.500
15	751,039	.58	.60	1.10	1.14	.60	.60	.525
16	795,218	.62	.64	1.20	1.24	.64	.64	.585
17	839,396	.66	.66	1.24	1.28	.66	.66	.600

Hydraulic pressure or "business" end of the test machine.

Mirror gage at bolster used in checking car-body deflection.

Dial indicator arrangement for measuring side-sheet buckle.

Pulling ring before attachment to the back cover plate with eight studs

How the OTC puller is applied with pulling shoe over the pulling ring

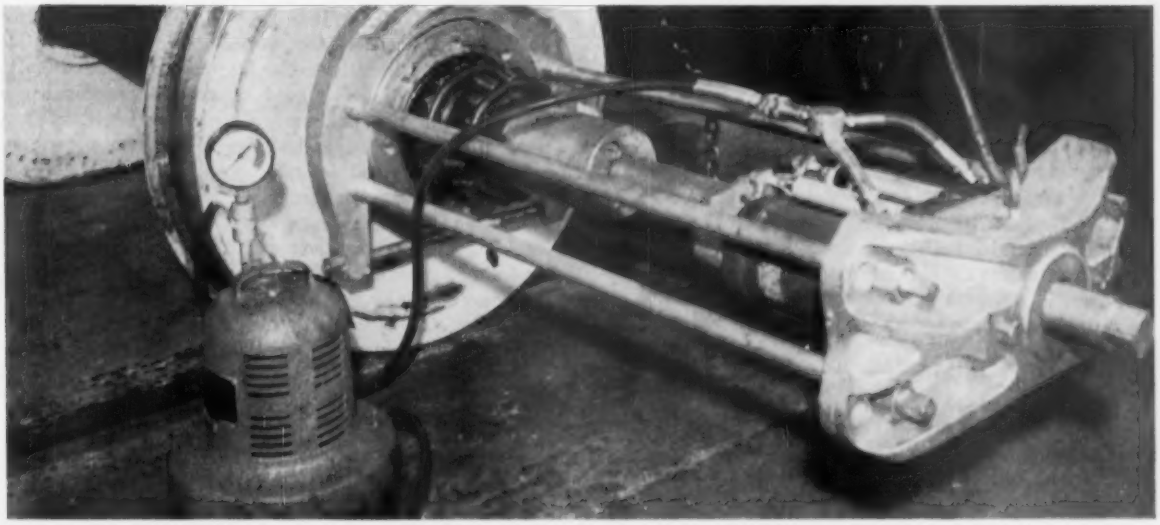
Santa Fe Uses New

Roller-Bearing Puller

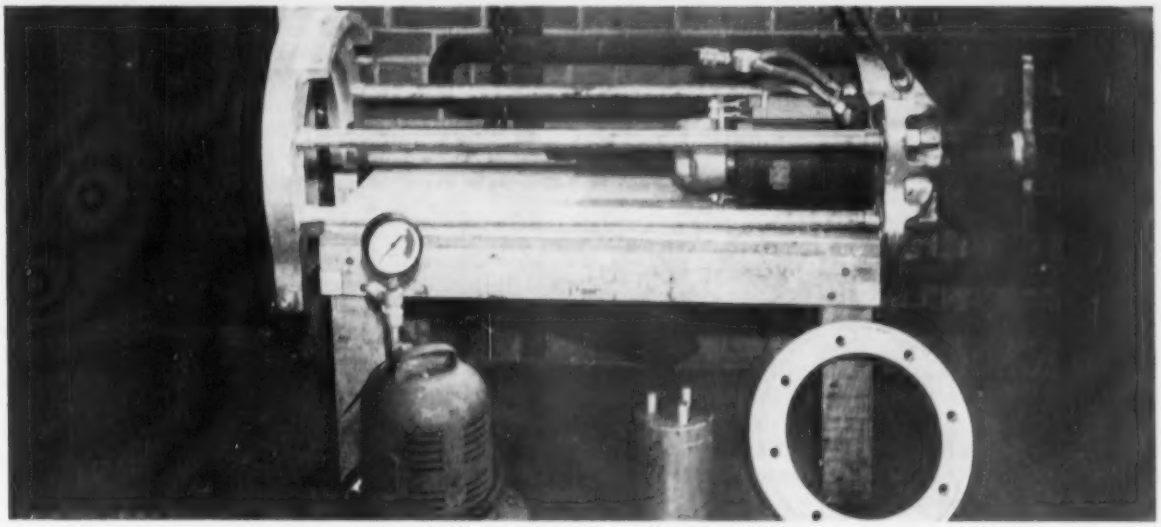
A new hydraulic pulling device of the type illustrated is now being used at three shops on the Santa Fe for removing axle journal roller bearings without pressing off the wheels, and attachments are available so that the puller may be used for either Timken or SKF bearings and for pressing on the roller bearings, as well as pulling them off. The puller works equally well on passenger-car, freight-car or diesel locomotive bearings.

The particular puller shown is installed at the 18th Street, Chicago, wheel shop of the Santa Fe where it is used exclusively for removing bearings, as a wheel press is readily available for re-installing them. Once the puller is assembled, it can be applied on one end of an axle and the roller bearing pulled in 20 min or less. The job is thus done quickly and easily with no distortion or damage to the back cover plate or bearing which may be cleaned, inspected and returned to service.

Another important advantage is that a programmed internal inspection can be made without disturbing the wheel fit, while in previous practice the wheel had to be pressed off to remove the bearing for programmed careful internal inspection. This frequently involved a turning and refitting operation as well as pressing the wheel on the axle again at appreciable cost in time, labor



OTC 100-ton twin hydraulic puller set up ready to remove roller bearing



Where roller-bearing puller is kept when not in use—Hydraulic pump guide tube and pulling ring in foreground

and material. With 1,600 roller bearings to be changed to new units having modified housings, enclosures and fingers, the Santa Fe expects to save the first cost of these three hydraulic pullers in six or seven months.

The device described here is the OTC roller-bearing puller, made by the Owatonna Tool Company. It has capacity to develop 100 tons pressure in twin hydraulic cylinders; more than enough to start obstinate bearings which have been in service a long time and may take 50 tons or more to break loose. After inspection and reconditioning, the bearings are generally re-applied at 25 to 30 tons pressure.

The sequence of operations is shown in the illustrations. A circular pulling ring is first secured to the roller bearing back cover plate by eight studs. A guide tube with 1⅝ in. tapped center hole is bolted to the end of the axle with long studs. The assembled puller is then lifted with a small jib crane and ratchet chain hoist into position over the axle and lowered with the pulling shoe between the wheel and the pulling ring. The puller screw is adjusted by hand to the guide tube center hole, a tie bolt applied in the bottom of the pulling shoe and hydraulic pressure supplied to the puller head from a portable electric-driven centrifugal pump and flexible metallic connections. This pump operates on any 110-volt circuit and is controlled by a switch in the base. The operator simply takes up slack in the puller until pressure is exerted between the end of the axle and the back cover plate, this pressure being gradually built up as shown on the gage until the roller bearing breaks loose and is pulled off the journal.

While a light and efficient tubular hoist frame is available for use with the OTC puller, the Santa Fe has installed the small jib crane, illustrated, which easily places the puller in position for lowering onto the journal. When not needed, the puller is just as easily swung out of the way against the shop wall where it is supported on a wooden table off the floor and well out of the way.

Interchange Rules Revisions—1955

Each year the AAR Mechanical Division makes the necessary revision to the Interchange Code of Rules and the high spots of the changes are reviewed before groups of car men in different parts of the country so as quickly to acquaint all those concerned with the revised rules. To this end the Eastern Car Foremens' Association, New York, set aside its February 11 meeting to hear Elmer G. Wallace, assistant supervisor of the D&H AAR Billing Bureau, discuss the many revisions to the 1955 rules. In making his presentation Mr. Wallace called attention to Section (h) of Rule 4 (and others) although these paragraphs do not come under the present changes. They are important, however, in terms of defect cards requested and money saved for the railroads.

The revisions to the 1955 rules follow.

Rule 2

Section (B), first paragraph—Modified to indicate that cars loaded with explosives and other dangerous articles must be handled in accordance with the I.C.C. Regulations and the United States Coast Guard Regulations when applicable.

New Section (E)—Added: "Cars not loaded in conformity with or failing to comply with provisions of applicable tariffs governing transportation by water carriers." Both of these changes were incorporated in Supplement No. 1—1954 Code.

Section (G) Paragraph No. 4—The 3 per cent for vacation expense to be applied to direct labor for the expense of transfer or adjustment of lading, when bills for same are rendered on the basis of actual cost, has been increased to 4 per cent. This paragraph also states the percentage to be added (separately) to this total to cover Railroad Retirement and Unemployment Compensation Taxes, and for overhead.

Rule 3

The effective dates of the following Sections have been extended to JANUARY 1, 1956:

Section (b-7)—Metal badge plates (brake levers).

Section (b-9)—Required braking power percentages.

Section (c-13)—maximum 1½-in. vertical clearance between top of coupler shank and under surface of striking face of striker casting.

Section (t-3-b)—Cast Steel Truck Side Frames having "I," "T" or "L" section compression or tension members. (Note following states no further extension will be granted.)

Section (b-8), Note 1 following—Modified to clarify the intent that "Replacement of defective or missing bottom rod and brake beam safety supports are to be in accordance with Section (m) of Rule 17."

Section (c-11), note following—Eliminated account no further extension granted beyond January 1, 1955 for this requirement that all cars equipped with former standard (except type D) or Temporary Standard Couplers having 5- x 7-in. shanks will be prohibited in interchange.

Section (r-5)—On June 2, 1954, the Secretary of the AAR Mechanical Division, issued a circular letter to the Members and the Private Car Owners calling attention to the condition of defect card receptacles and cardboard holders on freight cars, many of which are found missing, rusted out or otherwise defective. When system cars are on the repair track, this feature must be carefully checked and any necessary repairs made.

Section (s), new Paragraph (3)—Added to provide that automatic type slack adjusters applied to cars on and after January 1, 1956, must comply with AAR Standard Specifications and have Certificates of Approval.

Section (s), new Paragraph (8)—Added to provide that all car initials and numbers must be legible, from owners. When system cars are on repair tracks and such stenciling is found illegible, it should be renewed before car is released to service, likewise, illegible stenciling should be renewed on foreign and private line cars and charge rendered per Items 148, 149 or 147 of Rule 107.

Rule 4

Section (f-3)—Modified to provide that holes cut through metal side and end sheets of open top cars exceeding *two* inches (formerly *three* inches) measured in any direction are cardable in interchange. On cars equipped with AAR Standard or Alternate Standard lading tie down anchors, this limit is 1½ in. It is important that inspectors at interchange points make sure that all cars having such defects are properly covered by defect cards before they are accepted.

Section (h), Inspection of Tank Cars—Much closer inspections *must* be made at interchange points because of the continued request for defect cards by the tank car owners when cars are received in owners shops. Some of these damages involve dents in tank end heads, also side sheets and end heads of insulation jackets, which are costly items. Closer inspection should be made for loose and worn anchorage bolts and rivets, since if they shear off we become responsible under Section (3) of Rule 44, and often lading is lost if the bottom outlet casting becomes damaged by tank shifting on its underframe. The same necessary inspection applies also to cars of other types, particularly buckled center sills, etc., especially refrigerator cars and others having fishbelly type center sills.

Section (1)—There have been cases where foreign cars have been delivered to other roads with center sills buckled to the extent outlined in Rule 44, or other types of damage listed therein, and defect cards issued to cover. Defect cards should not be issued in such cases until investigation develops definite responsibility for such damage under the provisions of Rules 32 and 44, instead an Information Card should be attached to car and copy forwarded to the Billing Bureau for investigation and they will handle to conclusion.

Rule 7 and 8

Attention is again directed to the fact that a Billing Repair Card or record *must* be prepared covering every foreign and private line car that reaches shop tracks for any reason, even if only for examination, coupled to help switch a defective car, adjustment or transfer of lading, no bill repairs, etc.

Rule 9

Wheels and Axles R&R, eighth requirement—Eliminated which read "Purpose for which shopped, when wheels are condemned by any of the reduced demensions shown in Rules 71 and 75 (b-1) for cars on the repair tracks for other work." Billing repair cards being received indicate that shops are not removing wheels under these reduced dimensions when cars are on the repair track for other work. Closer inspection should be made to facilitate removal of these defective cast iron wheels from service and avoid accidents or subsequent shoppings when these shelled out or comby spots become longer.

Wheels and Axles R&R, last requirement—Added August 1, 1954, opposite this caption as follows: "If axles are rusted or pitted to the extent that reconditioning is necessary, billing repair card must specify 'No cutting or heating.' See new Interpretation No. 2 under Rule 84."

Care must be exercised in determining whether axle removed account rusted or pitted journal requires reconditioning account of *cut or overheated*. If not, the billing repair card must so state as outlined above to substantiate that the repairs are owner's defect.

Fourth sentence opposite "Journal Boxes Repacked, etc."—Changed to read 18 months to comply with Rule 66.

"General Heading"—Last sentence eliminated which read as follows: "The above information to be shown opposite each item, except where no bill is rendered." Billing repair cards covering wheels, truck sides, etc., as listed must show whether car is equipped with the approved packing retainer devices in "No Bill" as well as in "Bill Owner" cases.

Rule 16

Fourth paragraph—New sentence added as follows: "When new standards are applied at any location car *MUST* be stenciled indicating the *location* at which applied, for which a charge of ½ hour labor may be made, This stenciling to be shown *underneath* the new Standard Stenciling." For example, if a foreign or private line car is stenciled "NEW STANDARD 1-W WHEELS" and a pair of 1-W is applied in place of cast iron removed at location R&L 1, a figure "1" should be stenciled under the owners stenciling on each side or end of car, and should be shown on the billing repair card. If the R&L is already there, simply add the numeral.

Rule 17

Section (e), Note 6—States that "the majority class of beams under car, or if two beams are the heavier type, such majority class or heavier type will be considered as standard to car." Show this information on *record* repair card *only*, either front or back. Never substitute a lower beam for No. 18 beam since Note No. 9 hereunder, and Note 2 following price table for No. 18 beams on Page 220, provide a considerable penalty for such wrong substitutions.

Section (m), third paragraph—Modified to provide that when defective or missing bottom rod and brake beam safety supports, from which AAR. approval has been withdrawn, are renewed *in kind*, same continues as not chargeable but now defect card must be issued as outlined in Interpretation under Rule 19. Such defect card should be for labor only in cases of owners defects and for labor and material in cases of handling line responsibility. The most common type of brake beam safety support from which AAR approval has been withdrawn is the Universal cable type which has been superseded by the "G.N. Brake Beam Safety Support" (Conditionally Approved) which is Item 20 in the Approved List as shown on Page 239.

New Interpretation (A-4)—Added to provide that "substitution of old style angle cock, with or without supporting flange, in lieu of the new Wabcoseal angle cock (Pc. 549854 or N-7754) constitutes wrong repairs" and defect card should be issued for labor and material.

Rule 18

Section (E-1)—Modified August 1, 1954 to provide for the replacement of separate bottom rotary operation toggles (E-7) and lock lifters (E-8) of type "E" couplers preferably with E-24 articulated rotary lock lift riveted assembly complete, or with the riveted assembly E-14A, also, defective E-14A type should preferably be replaced with E-24 type and the E-24 type *must* be renewed in kind, which is now required in modified Rule 3-c-12 for cars built new or rebuilt on or after January 1, 1955. Item 134 of Rule 101 shows $2.50 as the charge for E-24, and Item 134 shows $1.70 charge for the E-14A.

Rule 19

Item 10—Modified to clarify the intent that journal bearings which do not conform to AAR Standard or Alternate Standard Specifications are prohibited in repairs to foreign cars, and subject to the penalty outlined in Interpretation under this Rule (same Interpretation as for safety supports Page 66).

Rule 25

Modified to provide that it is necessary to hold and report to owner such worn or corroded truck side frames removed under the requirements of this Rule, only if cast subsequent to 1926. Defective truck side frames cast in 1926 and prior thereto may be scrapped when removed.

New Rule 27

Added as follows—"Geared hand brakes on cars must be given periodic attention as outlined in Paragraphs 3-7, inclusive, of Specifications for General Repairs and Reclamation of Geared Hand Brakes shown on Pages E-95 and E-96 of the Manual of Standard and Recommended Practice on all cars receiving Class 1 general repairs or rebuilt as defined in Rule 112." These Specifications require complete dismantling of Geared Hand Brakes for repairs and testing after repairs are made.

Rule 33

Interpretation (2)—Modified to clarify the intent that responsibility of car owner for damaged safety appliances only (on other than tank cars) includes both *metal* and wood running boards and brake steps.

Rule 58

Modified to include the release control retainer valve (with or without bracket and strainer) as material for which the delivering company is responsible when missing.

Rule 61

New Paragraph (a-1)—Added to provide that "When cars are in general or class repair shop for overhauling or reconditioning, trucks must be removed and dismantled to the extent necessary for complete inspection and all defective parts repaired or renewed."

Paragraph (c)—Modified to clarify the intent that when car is on repair track and is jacked for *any reason, irrespective of responsibility*, the center plate must be lubricated, for which charge may be made versus car owner per Item 172 of Rule 101.

Rule 62

New First Note—Added to provide that when second-hand air hose are applied to freight cars (without charge), they must be tested as specified in Section (j-3) of P.C. Rule 7.

Rule 66

Paragraph (b)—Modified to indicate that the requirements of this Paragraph regarding periodic repacking of journal boxes are mandatory (by substituting the word *must* for *shall*, and the new last sentence added prohibiting the use of *WOODEN* dust guard plugs.

Section (j), former Item 6—Eliminated, as former Item 7 (now Item 6) provides that journal bearings must be renewed "when wheels and axles are changed." The Item 6 eliminated read: "When contour of brass is not suitable for the size of journal on axle applied."

Rule 66-A

New note following Section (L)—Added to read "Journal roller bearings on freight cars should preferably be all grease lubricated or all oil lubricated."

Rule 70

Section (a), Item 14—Modified to provide that cast iron wheels substituted for AAR X-2 or AAR X-3 cast steel wheels are wrong repairs as outlined in Paragraph (c-7) of Rule 98.

Section (b)—Modified to provide that M.W. or 1-W wrot steel wheels may be substituted for cast iron wheels under 70-ton covered hopper cars and the betterment charge made against car owner regardless of responsibility for the repair.

Rule 82

Paragraphs (b-2) and (b-4)—Remount limits—wording changed to clarify the intent. (b-2) changed to read "four or more" instead of "more than three" brake burn cracks and (b-4) changed to read "three or more" instead of "more than two" comby spots, on cast iron wheels.

Rule 84

New second paragraph—Added to provide that "when Alternate Standard Tubular Axle has been overheated in service to an extent where it is necessary to remove the pair of wheels involved from the car, such axle must not be reconditioned but must be scrapped at the handling line's expense."

Interpretation No. 2—Added August 1, 1954, to clarify the intent that rusted or pitted journals are owners responsibility unless the journals require reconditioning account of cut, overheated, or car was involved in flood damage. See remarks under Rule 9 regarding information which *must* be shown on billing repair cards in such cases of owners responsibility. This condition must be guarded against on stored cars, and when removing cars from storage.

New Interpretation No. 3—Added to clarify the intent that delivering line is responsible for journal boxes or truck side frames damaged in connection with cut journals or broken, due to heating.

Rule 98

Interpretation (4), note following heading "In Case of Delivering Lines Defects"—Modified by eliminating the phrase "no charge for turning" at end of both paragraphs, as charges and credits for 1-W wheels do not include any charge for turning.

Rule 101

In addition to prices changed in Supplement No. 1 to the 1954 Code, additional price modifications have been made on a number of items as a result of subsequent quotations (New Items Listed).

Item 2, new Note—Added to provide charge on basis of Rule 105 (actual cost) for the new Wabcoseal angle cock (Pc. 540854 or N-7754) only when renewed *in kind*. Billing repair card must show type removed and type applied to justify such charge. This new type or converted type should not be substituted for the old type on foreign cars since betterment charge is not permitted in such cases.

Item 100—Wabcogrip or Flexigrip fittings

Item 101-B—Wabcoseal offset elbow fittings, R or L

Same note added to each item stating, "Component parts applied separately shall be charged at Stores Department cost (Rule 105).

Rules 101, 107, 111

Material Charges (Rule 101), Labor Charges (Rule 107), Air Brake Repairs (Rule 111)—All combinations items (those including labor and material) adjusted to include the $.05 per hour increase in labor rates effective January 1, 1955, and any changes in prices of material.

Rule 111

Item 10—Modified to clarify the intent that the arbitrary $.71 allowance for the cleaning and testing a retainer valve or release control retainer, on or off car, does not apply to defective valves as outlined in Item 1 of this rule. In the latter event charge and credit are on basis of renewing the valve per Rule 101 prices.

Rule 112

Settlement for Destroyed and Badly Damaged Freight Cars, Section B, Paragraph 5—Modified to indicate that iceless refrigerator cars referred to, mean the mechanical type, and that basis for settlement on reproduction cost is outlined in Paragraph 3 of this Section B.

Section B, Paragraph 9, new Note 3—Added to provide for reproduction cost basis of settlement for tank car heater coils made of metals other than ordinary steel pipe, provided tank is stenciled showing kind of coils. When reporting any such tank cars for disposition ac-

count badly damaged or destroyed, report should show how car is stenciled for kind of heater coils, such as brass, copper, nickel, stainless steel, etc.

Section B, Paragraph (10-c)—Modified to provide for increased additional allowance in settlement for destroyed cars equipped with type AB brakes, wrot steel wheels, auto loading devices, air circulating fans and high tensile steels.

Passenger Car Rules

Rule 2

The effective dates of the following Sections have been extended to JANUARY 1, 1956:

Section (e)—Cardboards or suitable receptacles for defect cards and joint evidence cards.

Section (f)—Brake shoe spark shields over wheels.

Section (j)—Pitt type couplers.

Section (k)—AAR Standard Type "H" couplers.

Section (l)—AAR Standard Type "H" couplers, or Type "F" interlocking coupler, on Class "B" cars.

Section (h)—Modified due to manufacture of Alternate Standard Tubular Axle having been discontinued.

Rule 7

Section (e)—Modified to indicate that "In machining wheels and axles, and mounting of same, the current AAR Standard Wheel Shop Practices (Section XX of the Wheel and Axle Manual) *must* be followed."

Section (j-13), Note 2—Modified to provide that where untreated 36-in. M W—WS wheels are substituted for heat treated wheels, same shall be charged at 50% value instead of at scrap value as heretofore. The type and class of wheels removed and applied must be shown on billing repair cards to determine proper charges and credits.

Section (j-3), note—Modified by adding reference to an additional air brake instruction pamphlet, "No. 5039-2, the No. 3—U S B Test Rack—Code of Tests, U-12 Type Universal Valves 7-1950."

Section (l-1), new first Note B—Added to provide that requirements for the packing retainer devices shall be as provided in Interpretation No. 4 to Rule 66 of the Freight Car Code.

New second note—Added as follows: "Note—Journal roller bearings on passenger cars should preferably be all grease lubricated or all oil lubricated. Where car is found having both grease lubricated and oil lubricated journal roller bearings, all boxes must be checked and lubricated on the 30 day time limit basis."

Rule 8

Section (e), new second Paragraph—Added to provide for scrapping, at handling line's expense, Alternate Standard Tubular Axles removed account being overheated in service. Such axles must not be reconditioned.

Rule 13

Section (a), second item—Modified to provide that labor charge is now permissible where it is found necessary to R&R slack adjuster to unlock same. Show actual time for same on billing repair cards. Also see Item 20-K of P.C. Rule 21.

Fifteenth item (Gas domes, bulbs, globes, bowls, pillars or tips, applied)—Eliminated account no longer used in cars operating in interchange service.

Rule 21

Items 2 and 2-A—Modified to indicate that these labor charges cover electric light shades as well as bulbs or tubes.

Rules 21 and 22

Labor Charges (Rule 21), Material Charges (Rule 22)—All combination items (those including labor and material) are adjusted to include the $.05 per hour increase in labor rates effective January 1, 1955, and any change in prices of materials.

Note 2, Page 370—Modified to provide that "where repairing line is required to turn a 6 x 11-in. axle to 5½ x 11-in. axle to make repairs standard to car, such axle applied shall be charged at secondhand value, per Item 199 of Freight Rule 101." Otherwise, they shall be charged and credited at scrap value per same item.

A 20% REDUCTION in tool breakage has resulted from "price-tagging" all production equipment (left) and tools (right), at the Clark Equipment Company's Industrial Truck Division. The Company found that workers had more respect for their machines and tools when they realized that a machine cost $22,000, or that reamers cost as much as $18.75 each.

Ideas for the Car Repair Man...

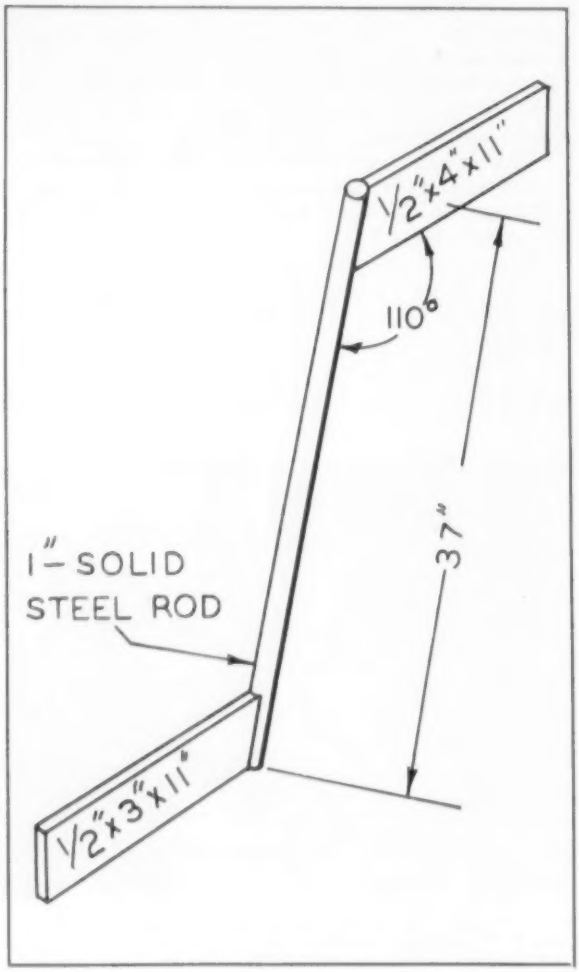
Dismantling Ride Control trucks on a rip track is easy with an offset lever that compresses the friction wedges by standing on the free end (actually the truck must first be rolled out from under the car). Details of the lever are shown below.

SIMPLE BAR COMPRESSES RIDE CONTROL SPRINGS.—A comparatively short, easily made and easily handled offset lever takes the place of a long bar for compressing the friction wedges preparatory to dismantling ASF Ride Control on a western road.

The lever is a 37-in. length of solid steel rod on either end of which a steel plate is welded as shown in the drawing. The plates are welded at an angle of about 20 deg off the true perpendicular to the rod. One plate is ½ in. by 4 in. by 11 in., the other ½ in. by 3 in. by 11 in.

The truck must be rolled out from under the car before the lever can be used to remove the weight and to lessen the distance between the friction snubber and the top of the side frame. With the weight of the car off the truck, the plate on one end of the lever is inserted between the top of the friction wedge and the under side of the top of the truck side frame. Standing on the second plate twists the first plate to compress the wedge and move the friction block eye into position for securing with a pin for wheel change or other truck work required.

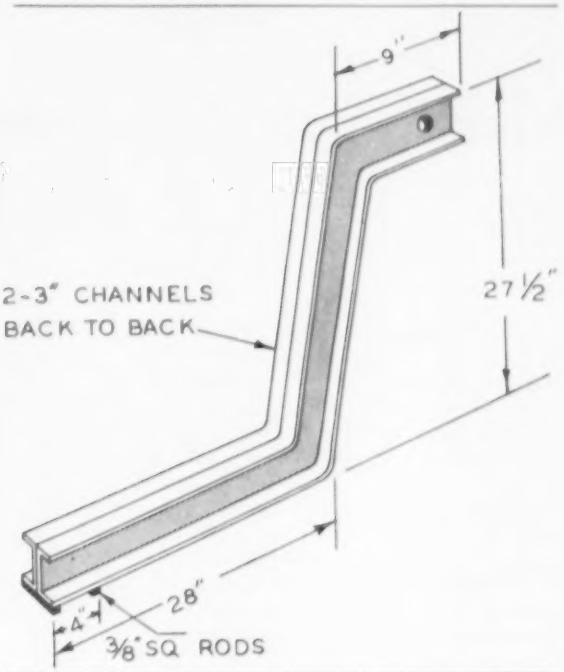
The plates are some 20 deg off the true perpendicular to enable the free end of the lever to clear the journal box when the man stands on it and lowers it. The two plates are different widths (3 in. and 4 in.) to adjust for the variations between trucks in the distance from the top of the side frame to the top of the wedge; for example, if this gap is large and the 3-in. end were inserted, the free end would, when stepped on, touch the ground before the wedge was compressed. Therefore, the end with the 4-in. plate would be used.



Boxes on both ends of one side of a truck can be worked with only one jacking of the side frame.

Combining a lifting lever with an old brake cylinder mounted on wheels forms a handy side frame jack.

A wedge is used between the lever and the bottom of the side frame to take up the free space

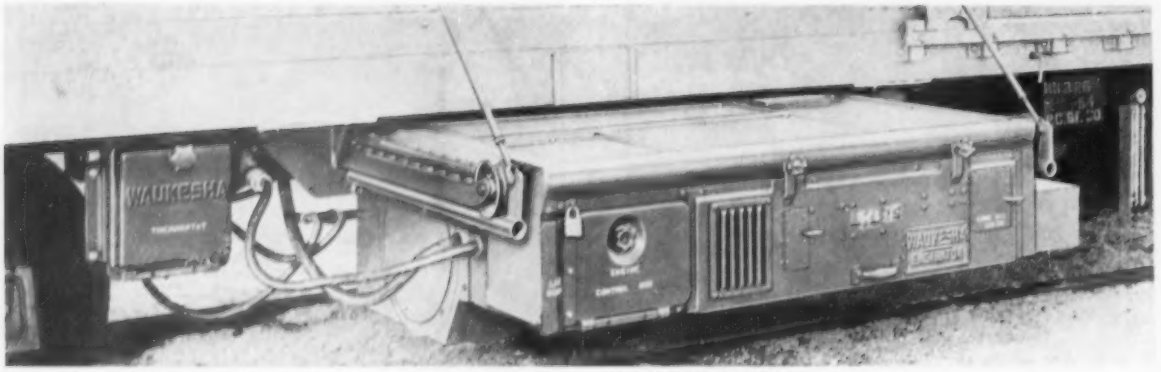


SIDE FRAME JACK FOR RIP TRACK USE.—The brasses and wedges from both boxes on one side of a freight car truck can be changed out with but one jacking of the side frame by a method developed by the Wabash for use on the rip track at Decatur, Ill.

The jack is made from an old 10-in. brake cylinder, to the top of the shaft of which is pinned an L-shaped lifting lever. Along the bottom of the lever two 3/8-in. square steel bars are welded. The end of the bar rests on the rail with one of these rods on either side to hold it in position. Admitting air to the cylinder raises the lever, with the end on the rail serving as a fulcrum to lift the side frame for renewing the brasses or wedges.

A wedge is inserted between the lever arm and the bottom of the side frame to take up part of the gap and to give a straighter lift. Small boards are also inserted between the truck side and the wheel hub. They prevent the box from going against the hub of the wheel which would otherwise occur as the side frame is tilted while it is being lifted. The purpose in preventing this contact is that it makes it difficult—and sometimes impossible—to put the wedge back in.

The jack and lever have a capacity for lifting empty 70-ton cars. The lever is made of two 3-in. channels welded back to back.



The 20-kw Diesel Enginator shown in rolled-out servicing position on tubular track extensions which are part of the mounting track assembly. At left is the weatherproof housing of the automatic thermostat control panel, which also contains the manual control for presetting car temperature.

Mechanical Refrigeration and Heating for Reefers

The Waukesha Motor Company has developed equipment for application to old or new cars which provides refrigeration or freezing and heating and ventilation service

■ Complete equipment for keeping temperatures in refrigerator cars in the 20 to 70, or the −10 to +5-deg F range, or to supply heating or ventilating service is now being made by the Waukesha Motor Company, Waukesha, Wis. The equipment may be used for new cars or for converting existing cars to mechanical refrigeration without structural change. As applied to cars designed for ice cooling, existing ice bunkers are removed and the system provides for loading the entire inside cubic capacity of the car, a gain of about 10 per cent in a 50-ft car. Packaged units allow easy removal for exchange or servicing.

The system for low temperature cars, required by the frozen food industry, consists of two completely packaged cooling and heating units which are installed in icing hatches, one at either end of the car, and a diesel engine-generator unit mounted under the car. For cars used exclusively for transportation of non-frozen products at temperatures of 30 deg F and higher, only one cooling and heating unit is required.

The installation of the power unit consists only of locating two mounting tracks on the underframe of the car. The Enginator unit is rolled into position on these mounting tracks which are equipped with extension rails which permit the rolling out of the unit for normal servicing and maintenance. A power conduit is installed from the power unit along the underframe of the car, up the end of the car and along the top of the car adjacent to the running board. This supplies the electric energy which operates the motor-driven cooling and heating units which are mounted at the top of the car.

To install the heating and cooling units which are completely packaged and freon-charged at the factory, the hatch cover or plug is removed and the cooling and heating unit is installed in the icing hatch frame. The cooling and heating unit is designed to fit into standard hatch frames and is equipped with an adapter plate to meet any variation in the frames.

The evaporator and air circulating fan extends down into the car. The electrically driven compressor and condenser projects above the hatch opening and working parts are accessible from the car roof. A heavy insulation barrier is located between the evaporator section and the condenser section of the cooling and heating unit.

The diesel fuel system usually consists of two, 200-gal diesel fuel tanks which are located on the underframe of the car. A battery box is also located on the underframe. An automatic temperature control panel is also located adjacent to the Enginator. Top and bottom inside

car temperature indicators are conveniently located on the side wall of the car. The system is also available for new car building programs in either top or side mounted units.

The Enginator

The Enginator consists of a 6-cylinder, 4-cycle diesel engine, directly connected to a 20-kw, 220-volt, 3-phase, 60-cycle fully-enclosed alternator which is interior-cooled by engine intake air and exterior-cooled by the radiator motor fan. The diesel engine is water-cooled by a large radiator with motor driven fans. The engine is rated 42 hp at 1,200 rpm.

The crankshaft is counterbalanced. Valves are Stellite-faced seating in Stellite inserts. Cylinders are renewable, hardened and wet-sleeve type. The fuel injection system consists of a seperate injection pump with pintle-type injectors. The lubrication system is full pressure to all main, rod and piston pin bearings, rocker arms and timing gears. The oil capacity is 22 quarts.

The engine is started by a 24-volt electric system. Sub-zero starting is accomplished with the aid of a 110-volt electric heating element, built into the engine coolant system and operated from standby electric service. Also included is the Chevron capsule-type primer. The Enginator is equipped with protective devices such as automatic shut-down controls guarding against engine overheating and lubrication failure. It is started and stopped manually since it operates continuously when the car is in revenue service. The unit, which is rated 20 kw weighs 2,100 lb.

Automatic Cooling and Heating Unit

The condensing section of the cooling and heating unit consists of a 3-cylinder, valve-in-head reciprocating type, air and refrigerant-cooled, hermetic type compressor operated by a 6-hp, 220-volt, 3-phase, 60-cycle motor at 1,750 rpm. The condenser is the high capacity, finned-tube type, air-cooled by dual integral ¾ hp motor fans. The refrigerant receiver is of fabricated steel and is located within the condensing section of the cooling and heating unit.

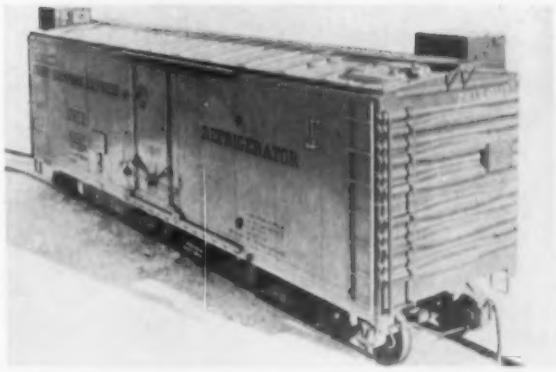
The evaporator section of the cooling and heating unit is separated from the condensing section by a heavy insulation barrier. The evaporator is of the finned-tube, multi-pass, counter flow type, employing a ¾ hp integral motor fan. The electric heater section is located between the evaporator and the motor-driven fan and is of 4 kw capacity and thermo-statically controlled. Defrosting is accomplished by fully automatic, electrically controlled hot gas.

The unit chassis is of fabricated high-strength alloy steel. The evaporator section is galvanize dipped. The unit capacity at 90 deg F ambient, with a car temperature of 0 deg F is 13,000 Btu per hour. Two units being used in low temperature cars provide a capacity of 36,000 Btu per hour. The total weight of the cooling and heating unit is 1,150 lb.

The control of the cooling and heating units is electric and fully automatic. This equipment is housed in a weatherproof accessible control box located on a side panel of the condensing unit. All motors and electric car heater are thermal-overload protected.

The thermostat of the system is of the electronic type. It is housed in a readily accessible control box conveniently located beneath the car underframe adjacent to the engine generator. It is equipped with a temperature dial divided into two ranges; an upper range from 20 deg to 70 deg F, and a lower range from —10 deg to +5 deg F. The cooling and heating units operate automatically and cycle on and off on demand. Cooling and heating is provided for automatically in the upper range for 20 deg to 70 deg F. The control system provides for cooling only in the lower range from —10 deg to +5 deg F. The system was designed to meet the operating conditions encountered in freight service and is not affected by changes in altitude and ambient temperatures.

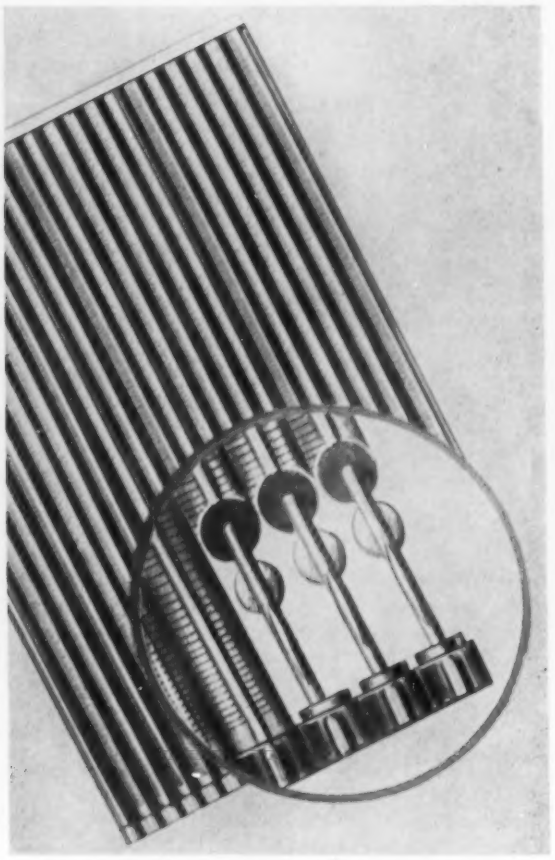
All installations are equipped with an electrical receptacle to permit the operation of the electrical condensing units from standby electric power.



A standard water-ice refrigerator car converted to mechanical refrigeration with the Waukesha "Diesel-Icer" system. A cooling-heating unit is shown installed in the ice-bunker hatches at each end of the car. The remaining hatches, shown closed, may be opened for ventilation cooling, if desired. Mounted under the car in operating position is the 20-kw Diesel Enginator.

Diesel-Icer system cooling-heating unit;—the upper condenser section which extends above car roof, contains the dual condenser fans, the motor compressor, condenser, and the refrigerant receiver. The galvanized-dipped lower evaporator section, which extends into the ice bunker, contains the evaporator, integral motor-fan, and thermostat-controlled electric heating unit.

A two-cell Type EH battery with a section of the container cut away to show internal construction.



A positive plate with magnified section showing how active material is packed into slotted plastic tubes around each grid spine.

Battery Capacities Have Been Increased

■ The Exide Industrial Division of the Electric Storage Battery Company has announced new car lighting and air conditioning batteries, type EH, which will deliver full rated power initially and throughout a longer working life than similar batteries made previously by this company.

The capacity increase is obtained by an increased length of plate. This is made possible by the performance of the Ironclad type positive plate. Long service showed that sediment deposits were so small, that in the same sized containers, there was room for plates of greater length.

The positive plates have been balanced with new "stable-voltage" negative plates to insure the delivery of full capacity throughout the life of the battery.

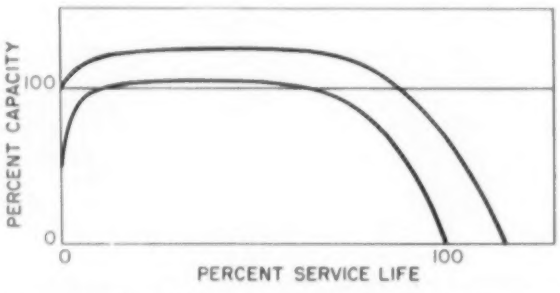
New Alloy Grids

Grids of the EH batteries are cast of an alloy called Silvium, a silver-lead alloy, developed by Exide engineers. The manufacturer states that by cutting down wear of the positive grid spines, the use of Silvium reduces power loss and charging time and also adds to the life of the battery.

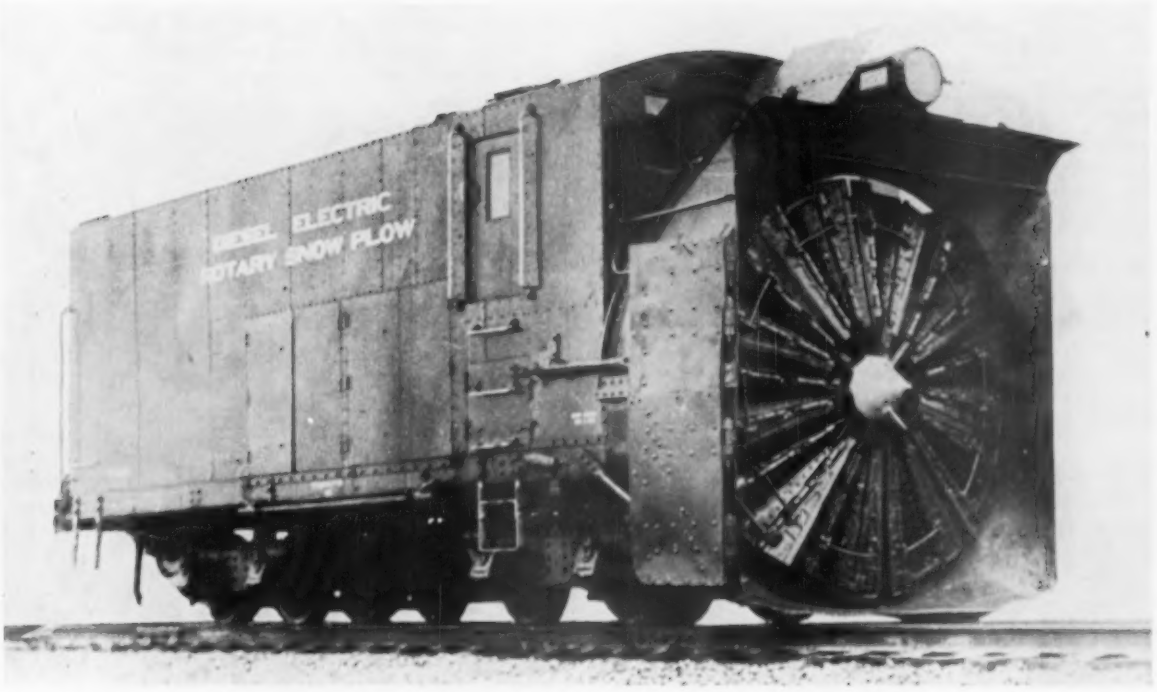
Finely slotted, acid-proof polyethylene tubes retain the active material in contact with the grid spines and permit it to be freely penetrated by the electrolyte. Tube sealers of the same material are attached to the bottom of the tubes, firmly sealing the active material. This prevents short circuits and lengthens service life.

The containers are made of a tough, durable hard rubber and have been designed with extra thickness for protection at points of greatest strain. End and side walls are ribbed to withstand shock and vibration encountered in railway service.

The batteries are available in two-, three-, and four-cell trays in capacities ranging from 268 to 1,320 amp-hr.



Upper curve shows relation of Type EH performance to battery rating.



Conventional rotary snowplow fitted with electric drive

Electric Drive for Rotary Snowplows

By A. H. Hoffer and
R. E. Willhite

Big power under almost completely automatic control provides means for rapid snow removal

■ As complete dieselization of the United States railroads approaches, the problem of replacing steam-power rotary snowplows increases. Numerous designs have been tried in the past decade, but thus far none has satisfactorily met all of the broad requirements. The electric drive here described features high reliability, overall simplicity, standard interchangeable components, inherent stabilization, and adaptability.

Power Requirements

The power required to drive a snowplow rotor depends upon (1) the weight of the snow to be removed per unit of time, (2) the net energy imparted to the snow, and (3) the overall electrical and mechanical efficiencies of the plow.

A study of the fundamental principles of the rotary snowplows shows that the power required by the rotor varies as the rate by which the cut is advanced. The available power must be divided between advancing the cut and casting the snow. In practice the relationship between these two varies greatly, so the ideal drive should permit utilizing the full output of the power plant over a wide range of rotor speeds.

Messrs. Hoffer and Willhite are both with the Locomotive & Car Equipment Department, General Electric Company, Erie, Pa.

The power required to drive a snowplow also depends upon the length of the line to be cleared in a given time, and the rate at which the line is being covered with snow. A rate of snow fall averaging one inch per hour is considered quite heavy, but rates up to four inches per hour have been recorded in mountain areas. Rate of fall, however, is not always the prime consideration. Depending on wind conditions and nature of the terrain, drifting of even a light snow can block a line more seriously than a high rate of fall.

Power requirements also depend directly upon the snow density. This varies widely with many factors, such as structure of the snow, the prevailing temperatures and wind conditions, and the time of settling. The structure may vary all the way from a light crystalline fluff to a heavy, lumpy, wind-packed, water-soaked encrustation. The rotor must be able to shear and discharge all types equally well. Fresh snow weighs between three and seven lb per cu ft, and wet snow, packed by slides and avalanches has been known to weigh as much as 50 lb per cu ft.

Besides possessing sufficient power, a good electric snowplow must fulfill the following generally accepted requirements:

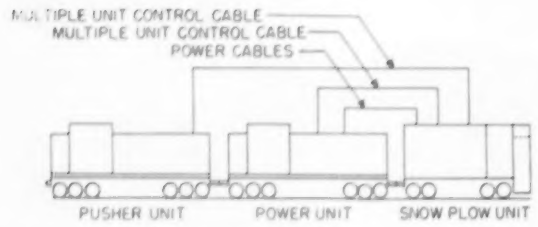


Fig. 1—Head-end of snowplow train showing cables between units.

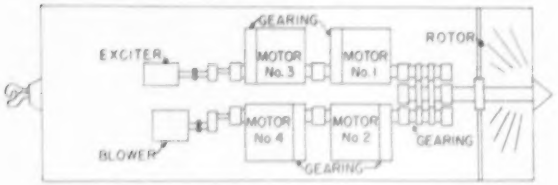


Fig. 2—Schematic arrangement of equipment in snowplow unit.

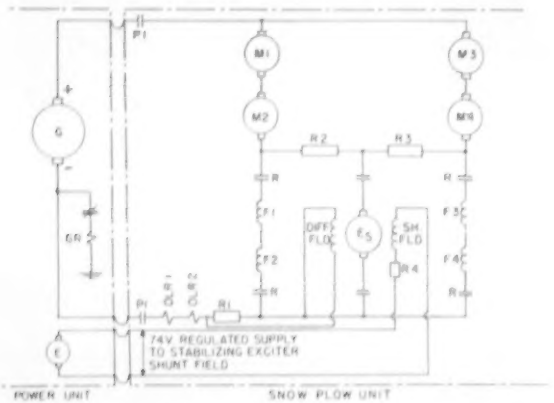


Fig. 3—Schematic diagram of circuits for electric snowplow drive.

1. It must be sturdy, simple and reliable, both electrically and mechanically.

2. It should be readily adaptable to any standard diesel-electric road locomotive unit.

3. Its use should require no alterations of the equipment in the power unit.

4. It should be made up of standard interchangeable locomotive components.

5. It should be inherently self-protective against overloads and overspeeds.

6. It should be able to operate gently and smoothly, with no sudden changes of torque or speed, over its entire speed range.

7. It should be able to adjust itself to meet sudden fluctuations in load.

8. It should be able to load the engine of the power unit to its rated capacity over a wide range of rotor speeds.

9. It should be able to operate equally well in either direction of rotation.

10. The operator should be able to control both the power and the pusher units remotely (multiple-unit operation).

11. The plow unit should be able to withstand the rotor reaction torque and have good tracking ability.

A thorough study led to a simple design which satisfactorily meets all of the generally accepted requirements. A stabilizing exciter causes plow drive motors to deliver the desired speed-torque characteristics at all times. The manner in which this exciter operates is the novel feature of the drive. By automatically regulating the strength of the drive motor fields it controls the speed of the rotor for any load. The operator only has to see that the plow is moving forward at a speed which results in the snow being cast no farther than is required.

The head end of the snow plow train—including the plow, power unit, the pusher unit, and the electric connections between them—is sketched in Fig. 1. The layout in Fig. 2 shows the rotor, gearing, drive motors, stabilizing exciter, and traction motor blower. The basic wiring diagram of the drive is shown in Fig. 3. Motors 1, 2, 3, and 4 are standard GE-731 series traction motors with standard gearing. Although four motors are shown, the basic system will work equally well with fewer larger motors capable of handling the rated output of the power plant. Stabilizing exciter, *A1*, is a GE-1185-M1 auxiliary d-c generator, rated 25 kw at 37½ volts.

The output of this exciter depends upon its speed and its net excitation. The speed is directly proportional to the speed of the rotor, making the exciter immediately speed sensitive. Its net excitation is the resultant of the shunt and differential field excitation. The shunt field excitation is constant (fixed by the setting of *R4*) and determines the no-load speed of the rotor. The differential field excitation (which varies directly with load current through *R1*) determines the speed of the rotor when under load. By simply adjusting *R1* and *R4*, the speed torque characteristics of the plow drive can be made to match the volt-ampere characteristics of any standard power unit. Once these adjustments have been made, the operation of the drive becomes completely automatic.

A standard reverser, *R*, allows the drive to operate in either direction of rotation.

Operation

The plow may be equipped to provide complete control of the speed and direction of the snowplow train from the plow cab by means of multiple-unit connections, or these functions may remain in the pusher unit as in the past. The power input to the rotor and its direction of rotation are regulated by the controller, similar to that found on locomotive B units.

After the motor circuits of the power unit have been separated from the generator the extension power leads to the snowplow motors are connected in their places. Additional auxiliary power for the plow is furnished by connecting extension leads to the auxiliary power system of the power unit.

Once the snowplow train has been made up with the necessary power, auxiliary and control connections, it may be moved to the sight of operations. Track conditions ahead can best be observed when operating from the snowplow cab, and the forward speed of the plow varied to maintain full load while casting snow the required distance.

To bring the rotor up to maximum speed, the snowplow operator notches his control all the way out. As the train moves forward into the snow, the rotor speed drops slightly until the plow has loaded the power unit engine

to its rated output. Any further demand for increased rotor torque results in a reduction of rotor speed. Although this reduces the distance the snow is cast, the output of the power unit engine remains at a maximum. Therefore, the distance the snow is cast can be controlled by varying the forward speed of the train. Hence, the snowplow drive utilizes the maximum output of the power unit engine over an extremely wide range of rotor speeds.

All other conditions being constant, the rotor speed decreases as the forward speed increases. As the rotor speed approaches one-half of its rated value, the rotor has difficulty in clearing itself and is in danger of stalling. (Stalling occurs when the snow is no longer moving fast enough to clear the chutes.) As the rotor speed decreases, the line current increases. Therefore, stalling is prevented by setting *OLR-1* to trip at the proper value of generator current. This removes the field of the pusher unit generator, returns its engine to idle, thus stopping the forward motion of the train and giving the plow a chance to clear itself.

If for any reason, the torque demanded by the rotor should exceed the safe maximum of the drive, *OLR-2* operates. This removes the field of the power unit generator and returns its engine to idle. After a moments delay, power contactors open, removing all power from the drive. The train may then be backed up and inspection made for hidden obstructions.

This drive has inherent speed regulation. However, in case a component failure causes the rotor to overspeed, the mechanical overspeed switch will operate. This removes the field from the power unit generator and returns its engine to idle. After a moment's delay, the power contactors are opened and all power is removed from the drive.

The plow must be able to track well even under maximum rotor reaction torque. During normal operation the reaction torque of the plow here described never exceeds 15 per cent of the safe limiting value for good tracking. In the event of the rotor striking a hidden obstruction, the instantaneous speed torque would be considerably greater than this 15 per cent, and would undoubtedly shear the pins provided to protect the drive.

The drive here described makes more power available to the rotor over a broader speed range than any other drive now known. It features low initial and maintenance costs, high reliability, overall simplicity, standard interchangeable components, inherent stabiliation, and extreme adaptability.

Experience obtained thus far indicates that this type of plow should be a great aid in removing the headaches of winter railroading in mountainous areas.

New GE Diesel Being Tested

■ A new four-unit, 6,000-hp diesel-electric road locomotive has been produced by the General Electric Company and placed in operation on the Erie for the announced purpose of evaluating components used in locomotives for export service.

Running normal freight schedules, its operation over an extended period will simulate as many export-type applications as possible. To achieve this end, two of the four units are powered by eight-cylinder, V-type Cooper-Bessemer turbo-supercharged engines. These four-cycle units develop 1,200 hp each for traction at 1,000 rpm. The other two units are powered by 12-cylinder engines of the same make that develop 1,800-hp each. The four units have a total weight of 490 tons and an overall length of 212 ft.

All units are equipped with GE-752 standard heavy-duty diesel-electric locomotive traction motors to permit testing under heavy American railroad operating conditions. Provision is made for full dynamic braking. Static excitation and the latest GE design control components are employed.

The units were built by General Electric to provide a means of accurately observing the performance of various standard components and of testing new standard devices in actual operation, with the aim of further improvement in design and performance.

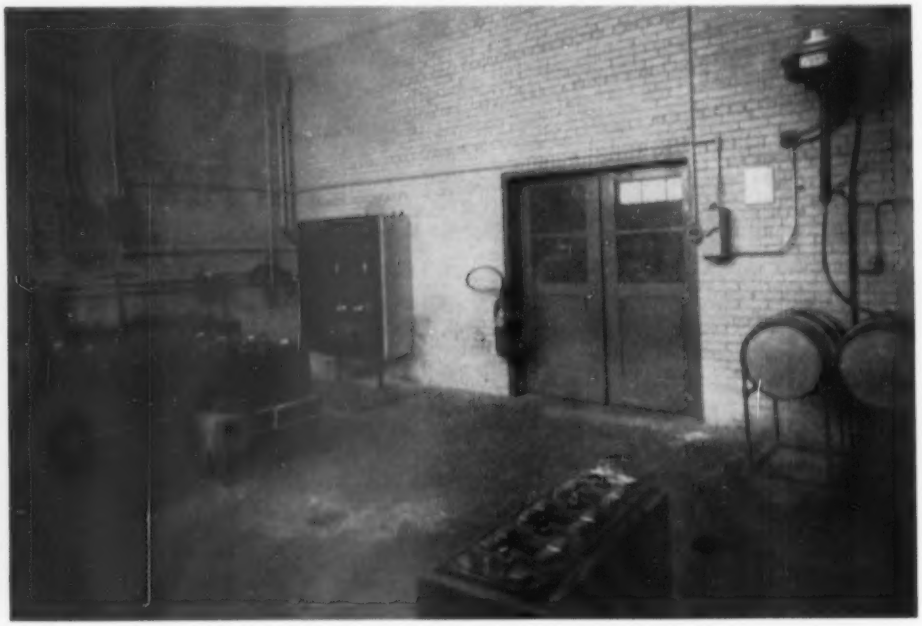
The Erie diesel locomotive shops at Marion, Ohio.

Erie Installs Battery Shop at Marion

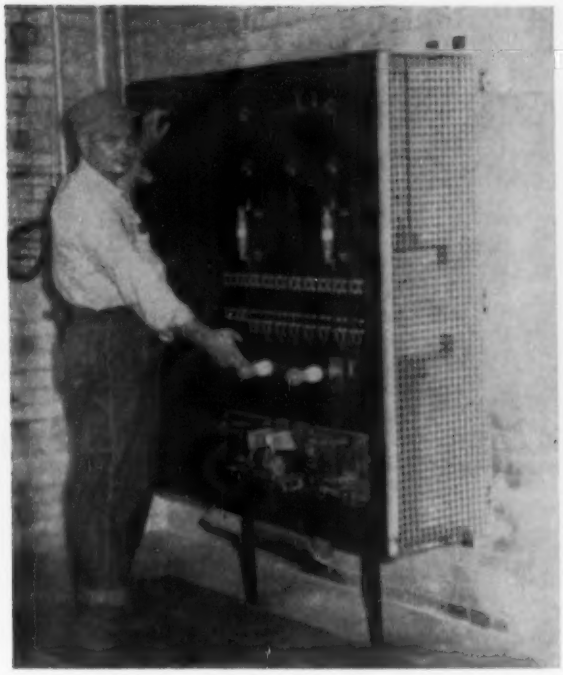
■ To serve the needs of its diesel-electric locomotive batteries at its Marion, Ohio shops, the Erie has equipped the battery room, shown in one of the illustrations. The equipment includes means for charging and discharging batteries to condition them, and determine their capacity, and for making repairs to connectors, replacing covers or trays, renewing seals, cleaning, etc. The Stokes still shown at the right in the picture of the shop interior supplies three gallons of distilled water per hour which is stored in the two barrels.

Charging current is supplied by a General Electric welding set. It is mounted on a bracket on the wall, outside the battery shop, to have the generator away from acid fumes, and to keep the noise of the set out of the working area. On the inside wall on which the welding set is mounted, are the starter for the motor and three, two-pole receptacles. Two of these are used to charge, and one to discharge, batteries.

In the picture of the control switchboard, the operator's left hand is on the rheostat which controls the field of the charging generator. On the right-hand panel are two charging circuits on the left and right respectively. In each circuit is a 150-amp. fuse, a circuit breaker, and a reverse current relay, the latter two being mounted at the bottom of the panel. The operator's right hand is on the switch which closes the left-hand circuit breaker.



The new battery room in the Erie's Marion, Ohio shops.



Control panel for charging and discharging locomotive batteries.

Charging set mounted on a bracket on outside wall of battery room.

When batteries are plugged in on these two circuits, they may be charged in parallel at the same voltage by means of the generator field control.

At the top of the right-hand panel is a double-throw, double-pole knife switch. When this is thrown in one direction, it connects two sections of a General Electric dynamic braking resistor in series with the right hand charging circuit. The resistor is mounted on the back of the panel and the two rows of small knife switches across the center of the panel may be used to short out sections of the braking resistor. In this way, two batteries may be charged simultaneously at different rates. A motor-driven blower for cooling the resistor is connected across the battery.

When a battery is plugged into the discharge receptacle, the double-throw, double-pole switch is thrown to the other position. This puts the braking resistor across the battery. The small knife switches may then be used to control the discharge rate.

There are three ammeters on the panel. The one in the center shows discharge current, and the other two charging current.

Batteries are cycled to determine capacity, and batteries with less than 80 per cent of their original capacity are scrapped. State of charge is determined by specific gravity readings, and batteries are discharged to 1.75 volts per cell. Full sets of batteries are discharged at the three-hour rate.

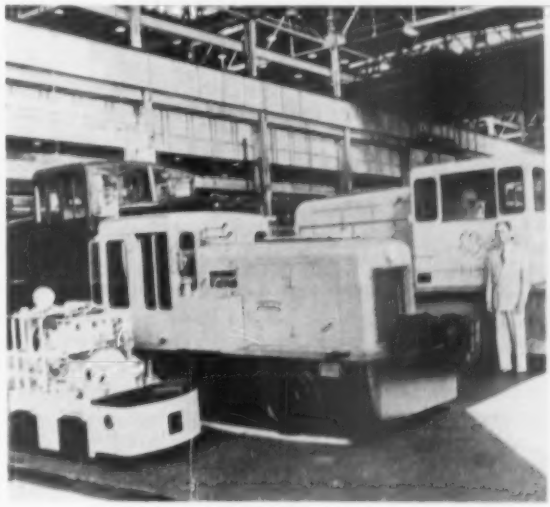
Midget Locomotives

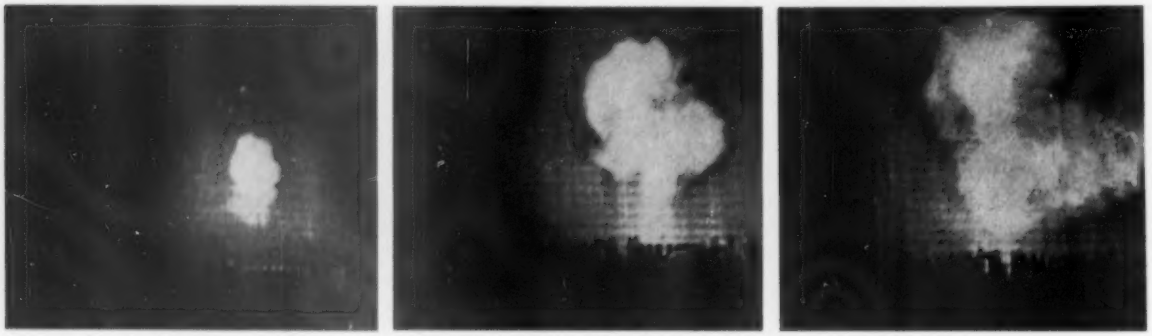
■ Two small locomotives are now in production at the General Electric Company's Locomotive and Car Equipment Department in Erie, Pa. J. W. Brauns, manager of G. E.'s Industrial Haulage Sales, is shown with the 1½ ton-trammer (left) and the 10-ton diesel (center) which are now the company's smallest locomotives.

Designed for both surface and underground hauling, the 1½-ton diesel trammer runs on either 18 or 24-in. gage track. Its normal six-ft length can be shortened to four ft for lowering on mining hoist cages. It is only three ft wide and four and one-half ft high.

The 10-tonner is produced for industrial plant switching and other surface uses such as in quarries, open-pit mines, salt mines, jute and sugar plantations.

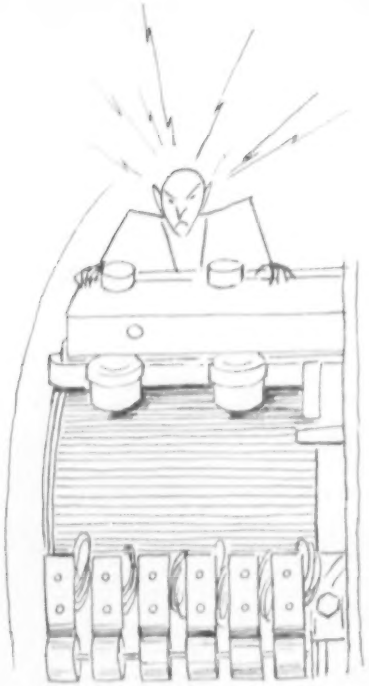
With the addition of these products to its line, General Electric now offers diesel and diesel-electric locomotives ranging in size from 1½ to 250 tons.





Progress of a traction-motor flashover as shown by the high-speed motion picture camera. The pictures shown were taken 1/2500th of a second apart, during tests made by the General Electric Company, in which the flashovers were caused deliberately.

The Two Basic Causes of Flashovers



High voltage is always looking for an escape path.

By Gordon Taylor

■ Flashovers on diesels are a great deal like the weather. Everyone talks about it, but not much is done about it. For quite a long time, we have kept flashovers under some control, but recently we have had too many cases of ground relay action, and a considerable number of severe cases of flashovers.

At one terminal, in particular, there has been a lot of honest effort made to correct this trouble, but flashovers have repeated in a number of cases where it was thought that the equipment had been properly cleaned.

Fundamentally, most flashovers are simply a leakage of current between brush holders of opposite polarities. Brush holders are so spaced that no normal voltage is going to jump from one to another.

A generator consists of circuits so insulated that it will contain or confine the current to its proper place. When a generator builds up its voltage, the commutator, brush holders, etc., are under electric pressure. As the pressure or voltage builds up, it is looking for leakage paths off of the commutator, or around the commutator, to reach its objective, which is the neighboring brush holder.

In other words, the current on the commutator is like a prisoner in a cell looking for a path of escape. When the current finds a streak of dirt, grease, or moisture, it then has a leakage path to the frame of generator or motor. The voltage will then take that escape path, to the opposite brush holder. What happens then is known as a flashover. The man who has to clean it up probably calls it something else.

The conditions that are favorable for flashovers are listed below:

1. Leakage paths on the armature and commutator of motors and main generators.

2. High voltage to provide the pressure for current to follow leakage paths. That is why most flashovers occur when the throttle is in the eighth notch.

3. A condition that causes momentary surges in generator voltage will induce flashovers. For example, slipping of wheels will unload traction motors momentarily. In a split second, the generator will have a rise in voltage which may be all that is needed to cause the current to take out over the leakage path.

4. Another well established cause of flashover is to operate the locomotive over a railroad crossing at high speed, where the brushes on traction motors will be bounced from good contact with the commutator. That will momentarily relieve the load on the main generator. The voltage will rise in a split second. If there is a leak-

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

age path, the current is on its way to cause a flashover.

5. A loose pigtail connection on a brush may wave around until it hits the commutator or a ground area. That will cause a flashover.

6. Short brushes which cause excessive sparking (due to poor contact) will fill the air surrounding the commutator with particles of material that will create leakage paths.

7. Control equipment (contactors, etc.) that is defective may cause a condition that will unload the main generator, which in turn will have a voltage rise that causes a flashover.

The above information boils down to this. Flashovers occur when high voltage finds a leakage path.

To hold flashovers to a minimum, observe the following rules:

1. Keep commutators and brush holder porcelains immaculately clean.

2. Check commutators for smoothness. Keep corner edges rounded and free of sharp points.

3. If a generator or motor has had a bad flashover that requires stoning, use a jig to hold the stone. Do not attempt to correct by hand stoning. Be certain to check the commutator with a dial indicator for out of roundness. If it is out, then correct by jig stoning. Also check for flat spots.

4. String bands must be kept immaculately clean. Do not make the mistake of thinking that insulating paint on a string band alone will correct the trouble. The band must be absolutely clean before paint is applied. Use quick drying paint, spread thinly. Remember that you cannot fool electricity. If there is any dirt under the paint, the electric charge will burrow beneath the paint for its leakage path. Anxiety to get the paint on a string band that has not been properly cleaned has been the cause of many repeat flashovers on units that were supposed to have been cleaned.

5. Maintain proper brush tension. Take care to secure brush pigtails when applying brushes.

6. Keep control apparatus properly adjusted and in good repair.

7. Have you noticed that many times it is the six o'clock brushholder that suffers the most damage? In it you will often find short brushes, or dirty brush holder porcelains. This is the brush holder that is hardest to get to, so apparently it is neglected. It is always a case of the hard-to-get-at items that cause the most trouble, so let us give the six o'clock brush holder better attention.

If maintainers will follow the above instructions, they will do much to control flashovers.

Now a word to the road foremen. Experience has proven that sudden unloading of a generator will cause flashovers. Locomotives should be operated with reduced throttle over railroad crossings and over dirt highway crossings where dirt or ballast may be on the rails and cause brushes to bounce on traction motors.

It is also known that high voltage will result from delayed forward transition. This sometimes provides the extra voltage peak that results in flashovers.

Enginemen should report mile post locations where flashovers occur. They should also report the speed and throttle position at the time of the flashover.

Remember that it requires a leakage path and voltage high enough to propel the electric charge along that path to cause flashovers. With that knowledge, we should be able to control this menace to diesel operation.

Spring Inspections Keep Summer Trains Cool

By David H. Noble

■ Spring house cleaning applies to air conditioning, too Once the frost is off the ground and old Sol starts wandering northward, it's time to work winter's havoc out of idle compressors. A thorough pre-season inspection will cure many of your air conditioning headaches before they develop.

Dirt Is Worst Offender

It should literally be a spring cleaning. Nothing can raise so much hob with a cooling system as dirt. Condenser and cooling coils will be covered with dirt that prevents free heat transfer between freon and air, motors will have accumulated brush and roadbed dust that clogs ventilating passages and provides leakage paths, and controls may be sticky from dirt in contacts and relays. In short, get the dirt out, and many of your troubles will be eliminated.

Dirt is an insulator, and it doesn't belong on either condenser or cooling coils. Unfortunately, it collects quickly on both, and unless removed you'll have a car that just won't cool when hot weather strikes.

Of the two, cooling coils are the easiest to clean. Most of the dirt is simply dust, and a good blowing with dry air will clear it out. If it's too greasy to blow free, a penetrating type cleaning solution will generally wash it out.

At the same time, clean the drip pan and condensate drain thoroughly. Drains frequently collect dirt during the heating season, and when hot, humid weather arrives a cascade of water splashes out of the return air grill. Needless to say, the goodwill of any passengers caught in the deluge is somewhat dampened.

Condensers

Clean condensers are just as important as clean cooling coils, but a thousand times harder to obtain. Roadbed dirt, brakeshoe filings, and other trash settle on the tubes and fins and form a cement that defies removal. Nearly every air conditioning supervisor has his own method of condenser cleaning designed to suit his own dirt conditions. Very few are completely satisfactory.

Two factors are evident in condenser cleaning: (1) a method which removes stubborn dirt and sediment also removes too much of the condenser; (2) it's easier to

keep a condenser clean through regular attention than to clean it after a year of neglect.

Baking and blowing remains one of the safest methods of condenser cleaning, and will remove a surprising amount of dirt. The condenser is first heated by disconnecting the sprays, blocking the air outlet, and running the compressor. As the freon pressure rises, so does the condenser temperature, until by the time the high pressure switch shuts the unit down it should be 125 deg F or better. The slight expansion of the tubes will break away much of the caked dirt, and a good blowing will clear it out. Several cycles of heating and blowing will work wonders, and best of all, it will not hurt the condenser.

Naturally, it will pay to watch the high pressure gage closely during the heating cycle, for too much pressure could rupture a condenser tube. The high pressure switch should protect the unit, but check frequently to be sure the pressure stays below 250 psi.

Spray condensers, which are the most difficult to keep clean, are being superseded by dry and flooded types, which require much less cleaning attention. While dry condensers collect a large amount of dust and roadbed dirt, it generally yields readily to blowing or washing with a mild soap. And if the condenser sumps are flushed regularly, a flooded condenser will require almost no cleaning between shoppings.

See that condenser sprays are checked too. Flush out the spray line, clean the strainer, and wash the nozzle, taking care not to damage the spray tip. Then check the pressure regulator setting in accordance with the manufacturer's instructions. Too little pressure and you won't get enough spray water to keep head pressure down; too much and you'll waste precious water.

Check and set the high pressure, low pressure, and spray switches. The high pressure switch is a vital safety device, and deserves special attention. You may never have heard of condenser or compressor explosions—but it could happen with serious damage to equipment and possibly a personal injury. The low pressure switch prevents the compressor from pulling a vacuum on the low side of the system. Should system pressure ever get below atmospheric pressure, air and moisture could enter the system through small leaks and cause trouble, so the low pressure switch should trip at 3 to 5 psi.

The spray switch, or spray valve, starts the water spray on the condenser when head pressure reaches a certain point to provide additional condenser cooling. It is generally set between 135 and 150 psi in accordance with the manufacturers' instructions.

Motors

Motors need cleaning, too. They'll get a lot of wear and tear during the summer months, so a thorough inspection is a necessity. Use dry air to blow the interior of compressor, fan, and pump motors. Check carefully for signs of commutator trouble, overheating, and leaking grease or oil seals. Lubricate the bearings and check them for unusual noise. It's a safe bet that a clean, quiet motor will give good service.

Spring is a good time to renew brushes on all motors. That way you'll start the season right. Look, too, for signs of sticking brushes and see that brush boxes are clean and spring tension correct.

Grounds in motors and control circuits should be cleared. Nothing can cause erratic operation like an elusive ground. Grounds also endanger mercury thermostats, and if you have split mercury trouble you probably have ground trouble!

Blow the dirt out of the controls, and check relay and contactor operation. And as an extra check, it's well to see if the correct thermostats and setdown resistors are installed.

Look for freon leaks. Freon carries a trace of compressor lubricating oil with it, and a small leak at compressor gaskets, shut-off valves, sight glasses or tube joints is easily spotted by a patch of oily dirt. The escaping freon deposits a thin oil film near the leak, and it rapidly collects dust and dirt. Freon is expensive, and leaks tend to get bigger, so it pays to repair even the small leaks promptly.

Freon solenoid valves are another source of trouble, so check to see they operate as intended.

Compressors

For compressors and expansion valves, it's strictly "hands off." If the compressor is quiet, the freon pressures are about right, there are no leaks at the head gaskets or seal, and the oil level is correct, then leave it alone. And if the car cools properly don't fool with expansion valve settings. You should, however, check to see that the expansion valve thermal bulb is tightly fastened to the correct suction line.

And, as a final check, start the equipment and let it operate. If you've done a thorough job, you'll have a cool, trouble free car. Sure, it's a lot of work, but nothing means as much to passenger comfort and satisfaction. So get hot on your spring inspections if you want to keep your summer trains cool.

Letter to the Editor

Sand Blast for Rails

Los Angeles, Calif.

To The Editor

For a century we have been sanding by pouring sand on the rail by slight variations of the pattern of sand delivery, various pipe sizes, coverging nozzles, and sand traps.

I believe that we should try sand-blasting the rail. It would be a simple matter of changing sand-blast delivery with high pressure air,—a similar or modified arrangement of the same equipment used in sand-blasting today.

It would probably require less sand. A clean rail surface would be the result, with maximum adhesion. I think it is worth trying.

I am one of your subscribers to Locomotives and Cars, and was very much interested in "Wheel Slip—Science Tells Why", by R. K. Allen, in the October 1954 issue.

Waves Blackwood

Questions and Answers

Interchange Rules

This is the sixteenth installment of a series of questions and answers on the Association of American Railroads Code of Rules Governing the Condition of, and Repairs to, Freight and Passenger Cars for the Interchange of Traffic which may help car men clarify their understanding of the philosophy, intent and requirements of the Interchange Rules. The answers given to the questions are not to be considered interpretations of the rules of Interchange, which can only be rendered by the Arbitration Committee acting officially. The comments, however, come from a background of intimate association with the application of the rules. Obviously, comments or opinions as of today, may be inapplicable after a revision of the rules or further interpretations by the Arbitration Committee.

170-Q—Where charge is made per Item 89-A for trimming spread lining of journal bearing as outlined in Item 5 of Section (j) of Rule 66, may additional labor charge be made per Item 89 of Rule 107?

A—Yes. Where journal bearing is removed separately to trim spread lining, charge may be made for one-half hour labor plus charge of 12¢ for trimming the lining. There has been some misunderstanding to the effect that journal bearings defective only to the extent of having spread linings may only be reclaimed in connection with the removal of all bearings from car for inspsction purposes when cars are repacked. However, this operation may be preformed in cases where bearings are removed separately for inspection purposes or where the bearings on other pair of wheels in unit type trucks are inspected in connection with change of a pair of wheels. This operation not only benefits the car owner in that it avoids permissible charge for a new bearing but also insures better performance than a new bearing in most cases because the bearing has already completely seated itself to full contact with the journal.

171-Q—In cases where it is necessary to back haul a badly damaged car from scene of wreck to a point where same can be loaded on another car and placed in condition for shipment to car owner, resulting in a longer haul than if car had actually been shipped from scene of wreck, and after home arrival of car the owner makes a change in plans and decides to dismantle instead of repair such car, thereby involving transportation charges to be paid by car owner, should the owner pay transportation charges for the complete distance moved on damaging road enroute home from the point to which it was back hauled and made ready for shipment?

A—Yes. In certain other cases in this same general category, wrecked cars might be taken from scene of wreck to a point closer to the home line to be placed in condition for loading and shipment to car owner and in such cases the car owner would actually benefit insofar as transportation charges are concerned. Therefore, over a number of cycles, the present rule should work out quite equitably for all concerned.

172-Q—In view of the uncertainty as to when charges versus car owner are proper for the application of details generally described on billing repair cards as "door post nailing strips", is it possible to define where charge for renewal is proper?

A—In cases where door post fillers or nailing strips standard to car are renewed, charge versus car owner is proper. However, where cleats or nailing strips are applied over regular door posts, with or without standard fillers, to facilitate application of grain doors or other means of door protection, such work is considered temporary repairs and no charge may be made.

173-Q—Where outlet cap is missing from discharge mechanism on a covered hopper car, is this considered as handling line's or car owner's responsibility?

A—This is classified as car owner's responsibility.

174-Q—Where car owner applies new wheels and axles to a new car which are mounted in conformance with the requirements of the Wheel and Axle Manual and two pair of such wheels are removed from car approximately three months later for reason specified on billing repair card as "oil seepage" may charge be made versus car owner for such repairs?

A—Yes. Rule 81 permits the removal of wheels from car having indications of being loose as evidenced by oil seepage. This may appear to be somewhat unfair but in all similar cases where wheels in question were originally applied by other than car owner, Rule 81 affords protection to the car owner for a period of one year. This provision should take care of the vast majority of cases in this category. Because of the importance of guarding against wrecks caused by loose wheels, sometimes determined only by the presence of oil seepage at inside of wheel fit, it is generally felt that the present provisions of this rule should be retained.

175-Q—Do the requirements of Interchange Rule 91 apply in case where bill dated November 14, 1952, is rendered in October, 1954, covering the return to car owner of serviceable material removed from a car which was wrecked in July, 1952?

A—The requirements of Rule 91 apply only to bills for car repair work and not to bills covering the return of serviceable material from destroyed cars or to other bills rendered under Rules 112 and 120.

176-Q—Where car owner makes repairs to own car on authority of defect card issued by another road and renders bill exactly three years later than the date appearing on defect card and includes regular reweighing charge in bill versus the defect card, is the damaging road required to pay such reweighing charge?

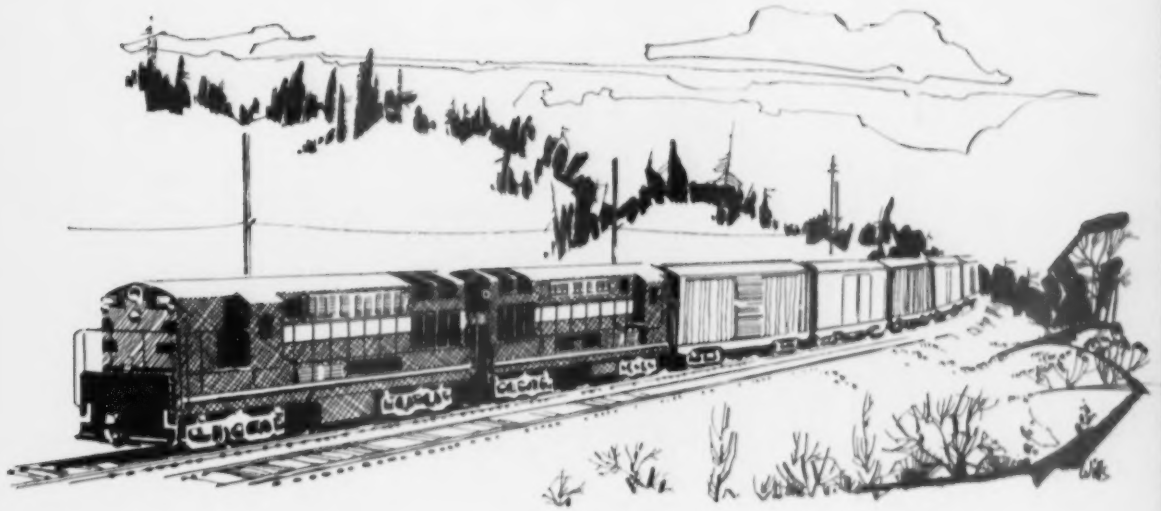
A—In such cases where the car is due for reweighing and restenciling under the provisions of Rule 30, the carowner is responsible for light-weighing of car and no charge should be made versus the defect card for this work. It is not proper to compute the time limit requirements for reweighing from the date car was damaged but rather from the stenciled date which appears on the car.

177-Q—Does Note 1 following Paragraph (b-8) of Rule 3 or Section (m) of Rule 17 govern charges for brake beam safety supports applied in 1954?

A—Charges for such work should be made in accordance with the requirements of Section (m) of Rule 17.

178-Q—Where Type E 5 x 7" coupler is applied and Type E coupler of same size removed by a foreign road and car owner later executes joint evidence to prove that car carried stenciling indicating 6¼ x 8" type E coupler standard thereto, should the repairing line issue its defect card to cover wrong repairs?

(Continued on page 76)



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the Difference!

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DIESEL WHEEL BORER

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Birmingham Company, Incorporated

(Continued from page 71)

A—Yes. Defect card for labor only should be issued in accordance with the substitution table under Paragraph (c-2) of Rule 17.

179-Q—Where journal boxes of car are repacked under the provisions of Paragraph (g-2) of Rule 66 and charge is rendered for one-half of the allowance specified in Rule 101, at the same time renewing five of the eight journal bearings involved and rendering additional charge of 2½ hours for labor, thereby bringing total charge equal to the full allowance for repacking such journal boxes, would this be proper?

A—Where charge is rendered for one-half of the allowance specified in Rule 101 for journal boxes repacked under the provisions of Paragraph (g-2) of Rule 66, additional labor charge for journal bearings renewed at the same time is proper only to the extent that total charge for repacking plus labor for renewal of journal bearings will not exceed the allowance in Rule 101 for complete repacking of journal boxes.

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

G177-Q—Where is the control air pressure regulator located?

A—Behind the steps leading into the operating cab on the right (engineman's side) of the locomotive.

G178-Q—How is the "control air" pressure indicated?

A—On a gauge next to the distribution panel.

Ground Relay

G179-Q—Where is the Ground Relay located?

A—Behind the small glass window, Fig. 1-11, on the engine side of the electrical cabinet.

Electrical Control Cabinet

G180-Q—What does the electrical control cabinet contain?

A—The various contactors, relays, and other equipment necessary for the electrical and electro-pneumatic control of the unit.

Alarm Bell and Signal Lights

(Manual 2310, page 121)

G181-Q—Where are the alarm bells and signal lights located?

A—One alarm bell and 4 signal lights are located on the engine room side of the electrical cabinet, Fig. 1-11.

G182-Q—What do these lights indicate?

A—The lights indicate hot engine, boiler stopped, low oil and alternator failure.

G183-Q—What are the indications in case of an alarm?

A—The bell will ring in all units, but a light will be lit only in the unit affected.

Cooling System

(Manual 2310, page 400)

G184-Q—What functions to circulate the water for cooling purposes?

A—Water is circulated through the engine radiators and oil coolers by two pumps mounted on the engine.

G185-Q—How is cooling air through the radiators controlled?

A—By shutters and four electrically driven cooling fans.

G186-Q—Is the operation of the fan and shutters manually controlled?

A—No, their operation is entirely automatic.

G-187Q—Under normal conditions what will the temperature of the engine cooling water be held at automatically?

A—Under normal conditions the temperature of the engine cooling water will be controlled so that the gauge will read in the green area (120-190 degrees).

G188-Q—Where is this gauge located?

A—On the inlet of the left water pump.

G189-Q—What functions to provide a method of altering the sequence of the fan and shutter operation?

A—A Summer-Winter selector switch, located in the AC contactor panel.

G190-Q—What takes place with the switch in Summer position?

A—The shutters will open before the first fan (#1) is turned on.

G191-Q—What takes place with the switch in Winter position?

A—In the Winter position the shutters will open simultaneously with the turning on of the third fan (#3).

G192-Q—What is the action in the event of excessive cooling water temperature?

A—The high temperature alarm switch will close, causing a red light to show in the unit affected and alarm bells to ring in all units.

Operating Water Level

G193-Q—How are the operating water levels indicated?

A—Operating water levels are stenciled on the water tank next to the water gauge glasses, to indicate minimum and maximum water levels with the engine running or stopped.

G194-Q—What is the minimum water level for engine operation?

A—The engine should never be operated with the water below the low water level (Fig. 4-2).

G195-Q—What does progressive lowering of the water in the gauge glass indicate?

A—Indicates a leak in the cooling water system and should be reported.

G196-Q—How is the water system filled?

A—Either through the filler pipe located on the roof of the locomotive above the water tank, or through the filler pipe at the rear of the unit on either side.

Fairbanks-Morse

Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

F178-Q—What is another indication in case of low lube oil pressure?
A—A push button on the engine side of the governor housing will move out approximately 3/8 inch, exposing a red band around the button.

F179-Q—What can be done to stop the alarm?
A—1. Push in button on governor. This will put out yellow low oil alarm light. 2. Isolate engine. This will stop alarm bells and put out blue alternator failure alarm light.

F180-Q—Will the push button trip if the engine stops for any other reason?
A—No, only from an actual low oil alarm.

F181-Q—What feature is provided to assist in determining the cause of low oil pressure?
A—A time delay is provided so that after a low oil alarm the engine may be started and idled for approximately forty seconds.

F182-Q—Can the engine be put "on the line" during the forty second time delay period?
A—Any such attempt will cause an immediate shut down if the low oil pressure condition is still present.

Load Regulator

(Bulletin 1706—101-A, page 29)

F183-Q—What does the load regulator consist of?
A—The load regulator, included in the governor housing, consists of a commutator type rheostat in the exciter battery (4 pole) field, with the rheostat brush arm operated by a hydraulic vane motor.

F184-Q—How is the vane motor operated?
A—By governor oil controlled by the pilot valve in the governor.

F185-Q—Is the operation of the vane motor brush arm visible?
A—Yes, it is visible through a window.

F186-Q—What is the brush arm travel?
A—Brush arm travel is from 7 o'clock at minimum field (marked MIN) to 5 o'clock at maximum field (marked MAX).

F187-Q—What is contained in the governor?
A—The governor contains a load control pilot valve which is connected to the tail rod of the power piston and also the speed setting piston by a floating lever and linkage.

F188-Q—When will the governor pilot valve be centered, or at its balance point?
A—When the fuel injection setting is correct for the speed setting.

F189-Q—What takes place if the engine load tends to exceed the rated figure for any engine speed?
A—The balance between the power piston (controlling fuel injection) and the speed setting piston will be disturbed, causing the load control pilot valve to allow governor oil to flow to the load regulator.

F190-Q—How does the load regulator now respond?
A—The regulator will move toward minimum field, or in a direction to insert more resistance in the exciter battery (4 pole) field.

F191-Q—What is the result of this regulator movement?
A—The load on the main generator is reduced and the engine is prevented from overloading at any engine speed.

American Locomotive

Diesel-Electric Locomotives

This series of Questions and Answers pertaining to Alco diesel-electric locomotives with General Electric electrical equipment is a continuation of a series, the first of which was published in the October 1950 issue of Railway Mechanical & Electrical Engineer. The references to manuals and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

1155-Q—What is the next operation?
A—Move the generator into engagement with the engine generator adapter. After the crankshaft and armature spider fit have engaged a short distance, the generator frame will start to engage the bore of generator adapter.

1156-Q—What precaution must be taken?
A—Do not pull into full engagement until the coupling bushings are partially entered. Use two foot hard wood boards 1½ in. thick to hold generator away from adapter.

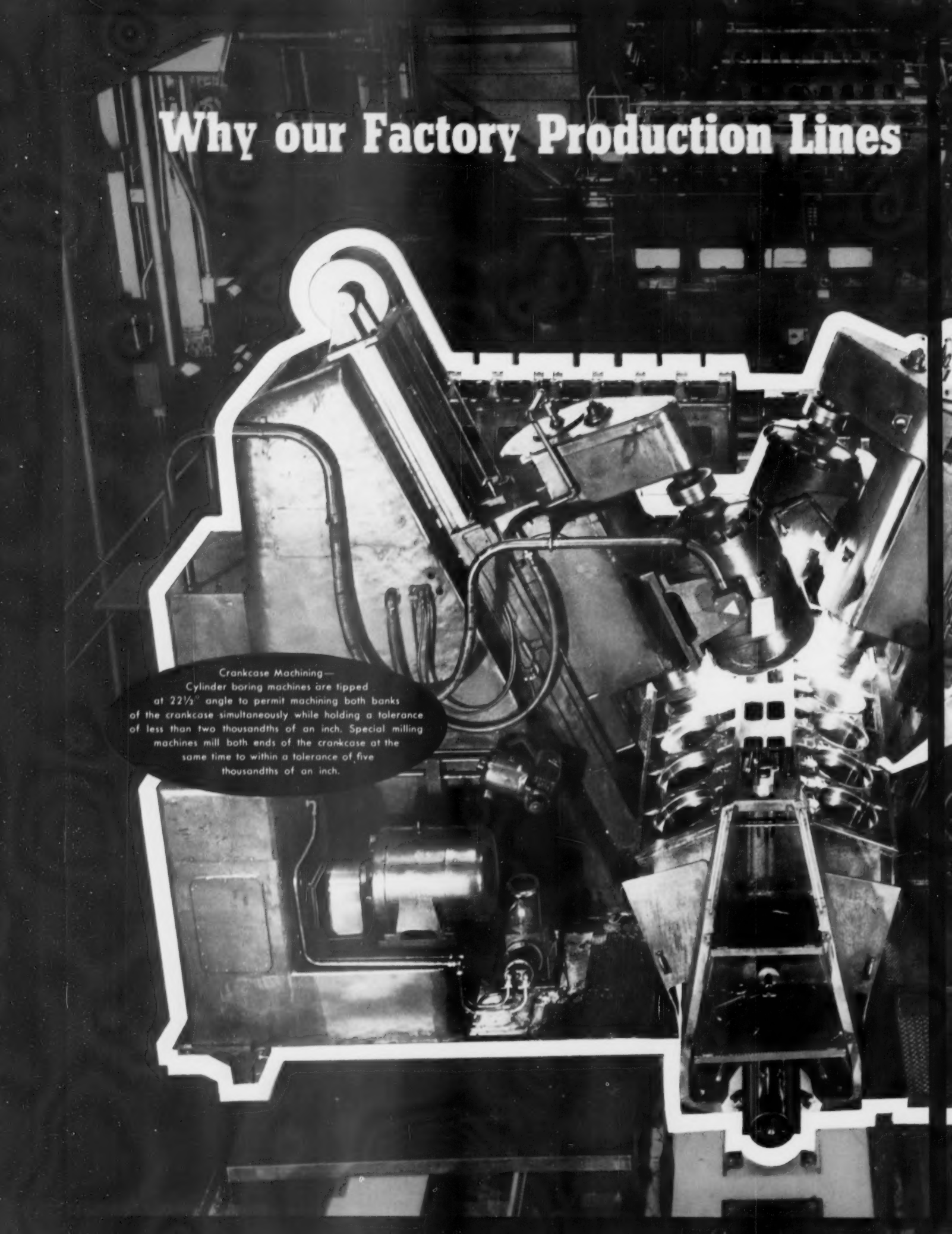
1157-Q—Describe the final action.
A—Remove cardboard strips from space between armature and poles. Tighten stud nuts between generator adapter and generator frame. Tighten and lockwire bolts.

Applying New, Reconditioned or Exchange Generator with Belt Driven Auxiliaries (Generator not balanced)

1158-Q—What is the initial operation under above conditions?
A—With generator removed from the engine and the

(Continued on page 80)

Why our Factory Production Lines



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GENERAL MOTORS LOCOMOTIVES

**Factory Branches at Halethorpe, Maryland Jacksonville, Florida • Robertson, Missouri Emeryville, California • Los Angeles, California*

(*Continued from page 77*)

fan attached, rotate fan until any one of the three groups of balance weight holes are at the top of the fan.

(*Manual TP-500, page 516*)

1159-Q—What action should follow?

A—While facing the fan, mark the lower right hand hole of this group for identification. When assembling the generator to the engine, the marked hole should be lined up closely with the center line of the crank nearest the generator. For completion follow all steps except No. 1 of the preceding article. Balance generator to engine.

Schedule 24 RL Air Brakes

1820-Q—What contact is utilized for this purpose?

A—Contact A7 of relay T. While shown on Plate 13 as supplied from B+, it will be explained later that the actual supply to contact A7 is determined by the position of another relay.

1821-Q—For the time being, what facts can be understood?

A—That if relay U is energized at the time brakes are applied and relay T drops out, relay U will continue to be held energized by the battery supply to contact A7-A6 of relay T and thence through contact C5-C4 of relay U to resistor R15 and the coil of relay U.

1822-Q—How do the circuits in Plate 14 compare with those in Plate 13?

A—They are identical with the exception that switch SW has been added in order to provide means for disconnecting the battery supply to the equipment when desired.

1823-Q—What other devices have been added?

A—In addition, the fuses F have been placed in the line.

1824-Q—What kind of fuses are they, and how are they replaced if necessary?

A—They are 5 amp midget fuses and can be replaced by unscrewing the plastic caps at the left end of the cabinet. The fuses will be pulled out when the cap is removed.

1825-Q—Is Plate 15 more complicated than Plate 14?

A—At first glance it would appear so, however, upon examination it will be found that this plate is identical in every respect with Plate 14 with the exception that an additional Wheatstone bridge has been added.

1826-Q—What is the purpose of the additional bridge?

A—The previous circuits had used only one bridge, which was for the application magnet wire. This is now the top bridge in Plate 15. An additional bridge, the lower of the two, is used to measure the resistance of the release magnet wire circuit.

1827-Q—Describe the lower or release bridge.

A—The same resistors are required for each bridge, and resistors R1-R2, etc., for the application bridge become R1A-R2A, etc., for the release bridge. The contacts of relays W and X, used for shorting the arms of the application bridge are unchanged and additional similar contacts are used for shorting the arms of the release bridge.

1828-Q—Describe the arrangement further.

A—Similarly an additional detector relay Z is used, which performs the same functions as relay Y. The contacts of these relays are placed in series to control the directional relay V and the time delay relays W and X in order to insure that both relays Y and Z are picked up at the same time and released at the same time.

1829-Q—With the contacts so arranged, what is the effect?

A—The failure of one relay to release at the proper time will stop the pulsing action just the same as if only one bridge were being used.

1830-Q—Describe further additions shown on Plate 15.

A—An additional milliameter MAA is placed in series with relay Z and an additional contact A3-A4 of switch S is used to short the meter MAA. Finally, additional contacts C3-C4 and C5-C6 of relay T are used.

1831-Q—Why are these contacts used?

A—In order to disconnect the release bridge from the relay magnet train line wire when the brakes are applied.

1832-Q—What is shown in Plate 16?

A—The means for performing the operation to cause relay T to assume the release position when brakes are applied.

1833-Q—How the B1 master controller application and release contacts affected when an electro-pneumatic brake application is made?

A—The B1 master controller operates to close its application and release contacts. The release contact is maintained in a closed position at all times the brakes are applied, except when the brakes are graduated off. This contact, therefore, holds the release magnet energized and serves as a convenient means of determining when the brakes are applied.

1834-Q—What has this to do with relay T?

A—This means is made use of in controlling the operation of relay T. As described earlier, relay T is supplied from battery current through resistor R24.

1835-Q—What does Plate 16 show?

A—That this current flows through the lower of two coils in relay T.

1836-Q—Describe the connections in the upper coil.

A—The upper coil is connected to the release wire, and the circuits are so arranged that the current in the upper coil is opposite in direction to that in the lower coil.

PERSONAL MENTION *(Continued from page 11)*

W. H. Mims

H. E. Hales

office, Nashville, Chattanooga & St. Louis in Nashville, Tenn. Entered employ of CofG in February 1944, serving successively as assistant shop engineer at Macon; shop engineer; assistant mechanical engineer at Savannah; assistant general foreman, Savannah shops, and electrical engineer. Mr. Mims is a registered professional engineer, State of Georgia.

New York, New Haven & Hartford

HARVEY E. HALES appointed chief mechanical officer at New Haven, Conn. *Born*: Columbus, Ga., April 8, 1918. *Education*: Industrial High School, Columbus. *Career*: Began with Central of Georgia in 1942, serving successively as telephone and telegraph maintainer, equipment engineer and electrical engineer until January 1949 when he was appointed superintendent of motive power at Savannah, Ga.

Norfolk & Western

F. W. BALTHIS, gang foreman, electrical department, Roanoke, Va., shops, appointed electrical foreman at Shaffers Crossing shop.

Chicago & North Western

E. J. FITZGERALD appointed master mechanic, Dakota division, with headquarters at Huron, S.D.

Northwestern Pacific

CLAIR B. FISH appointed master car repairer at Tiburon, Cal. Mr. Fish formerly assistant master car repairer, Western Division, Southern Pacific.

Southern

KIMBLE L. POLLITT, engineer cost control, appointed engineer quality control, Hayne shop, Spartanburg, S. C.

JACK R. BARKLEY appointed engineer cost control, Hayne shop, Spartanburg, S.C.

Union Pacific

L. L. HOEFFEL, mechanical superintendent at Los Angeles, transferred to headquarters at Salt Lake City, Utah.

Virginian

W. W. OSBORNE, master mechanic, Norfolk division, Victoria, Va., appointed assistant superintendent motive power, with headquarters at Princeton, W. Va.

W. A. GRIGG, general foreman at Mullens, W. Va., appointed master mechanic, Norfolk division, with headquarters at Victoria, Va.

R. R. MCDANIEL, assistant to general foreman at Mullens, W. Va., appointed general foreman at Mullens. Former position abolished.

SUPPLY TRADE NOTES

AMERICAN BRAKE SHOE COMPANY.—A composition brake shoe for railroad use, designated the "Diamond Comet," has been developed by American Brake Shoe and is ready for field testing, it was announced by *Kempton Dunn*, company president, on March 8. The new shoe formed of friction materials in an organic binder, wears longer and gives smoother, quieter stops than the cast-iron brake shoe. It was developed in the Mahwah, N. J., laboratories of the company after many years of research on materials and methods. The problem, according to Mr. Dunn, has been to eliminate the inherent tendency of composition shoes to cause greater wheel wear and to be less dependable in wet weather. Only actual railroad operation will show whether these shortcomings have finally been eliminated.

Field testing of the new composition shoe began on an eastern railroad last month. It requires some changes in the braking equipment of present cars. Another composition shoe, now under development in the laboratory, will be completely interchangeable with present cast-iron shoes without the expense of changes in brake rigging.

The company's experience with composition brake shoes extends back to post World War I when it acquired the Pittsburgh Filled Shoe Company. Since then the American Brakeblok Division has made composition friction materials for automobiles, trucks, buses and heavy industrial applications. The search for composition materials suitable for railroad use was intensified after World War II. From hundreds of combinations tested came the present shoe which the company believes warrants field testing.

Mr. Dunn said that the metal shoe has proved to be completely dependable under all weather conditions and under all loads. It costs less, both initially and in terms of wheel wear, than the composition shoe. The latter will have to show in actual operation that it produces dependable friction under all conditions without causing greater wheel wear, he said.

"If the new shoe overcomes the disadvantages of previous composition shoes tested by the railroads," said Mr. Dunn, "it can be produced in the company's facilities."

■

AMERICAN LOCOMOTIVE COMPANY.—Rear Admiral *Wilson D. Leggett, Jr.*, USN, chief of the Navy's Bureau of Ships, has been appointed vice-president of engineering. Mr. Leggett retired from USN service on March 31.

WORTHINGTON CORPORATION.—*William A. Meiter*, central sales manager at Detroit, has been appointed general sales manager, with headquarters in Harrison, N. J. *Clarence S. Wentworth*, manager of the Detroit district office, succeeds Mr. Meiter as central sales manager.

■

BABCOCK & WILCOX CO.—The assets and business of the *Globe Steel Tubes Company* of Milwaukee have been purchased by Babcock & Wilcox who will continue to operate the Milwaukee plant as a part of its Tubular Products Division. Operations at the plant will continue without interruption and present production personnel will be retained.

■

PERMACEL TAPE CORPORATION.—The Dallas, Tex., division office and warehouse of Permacel has moved to 9000 Denton Drive, Dallas 20.

■

VAN DER HORST CORPORATION.—*Dr. Hyman Chessin* has been appointed assistant director of research and development.

■

INDUSTRIAL BROWNHOIST CORPORATION.—*Warwick J. Hayes, Jr.*, sales

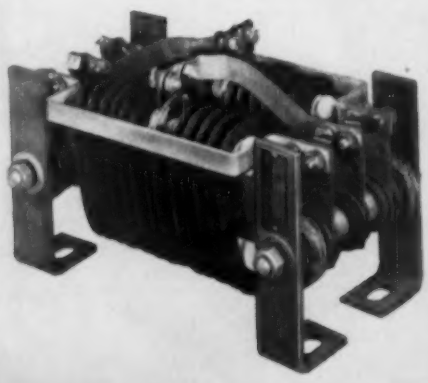
(Continued on page 84)

Using a precision involute checker developed by G.E., a quality control expert inspects a gear to make sure teeth have the accuracy necessary to resist fatigue failures.

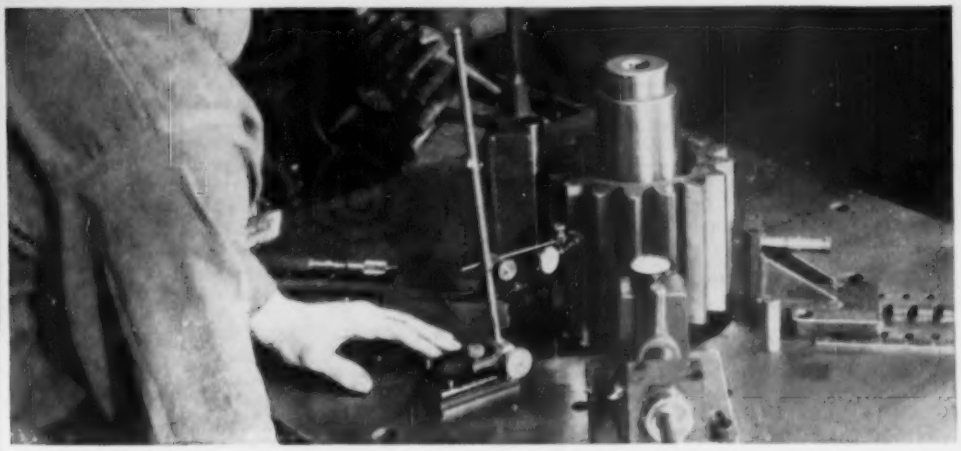
2. GE-RECOMMENDED CARBON BRUSHES are selected for the proper degree of hardness and grain structure to minimize wear and tear on commutator surfaces.

3. G-E MOTOR SUSPENSION BEARINGS give long life—have an oil-return feature which can save up to $85.00 per locomotive unit annually.

4. G-E RESISTORS have floating steel backbones that expand and contract freely with high temperature changes and therefore are not subject to buckling forces.



7 G-E replacement parts for better locomotive operation.



1. G-E GEARING is specifically designed to help cut maintenance costs. This GE-developed pinion stand permits inspectors to perform a quick check on all pinions for pitch line runout, parallelism of teeth with bore, outside diameter, and tooth thickness.

How your maintenance costs are cut with General Electric quality-controlled gearing

Because they are checked and rechecked throughout all phases of manufacture, General Electric gears and pinions can carry the heavy starting loads and take the running shock loads encountered in heavy freight and high speed passenger service. Through G-E quality control, you'll save maintenance dollars when you specify genuine G-E gears and pinions for your locomotives.

Backing up intensive quality control, G-E metallurgical research has developed materials to resist fatigue failures and to provide long-life gearing. With a combination of high hardness, superior strength, and the highest degree of accuracy, G-E gears and pinions give "new equipment" performance longer.

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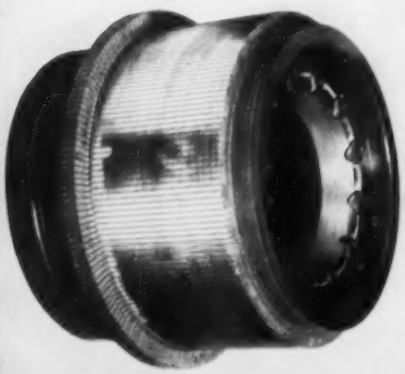
5. G-E COMMUTATORS retain smoothness in service because high-speed, high-temperature seasoning process sets segments firmly in place.



6. G-E ARMATURE COILS are available as part of complete rewind kits for your convenience. Every coil is dimensionally accurate and quality insulated for longer life.

7. G-E CONTACT PARTS break circuits quickly with minimum metal transfer because G.E. gives attention to the smallest parts.

Manufacturers' Literature

Following is a compilation of free literature, pamphlets, and data sheets offered by manufacturers to the railroad industry. Circle the number (s) on coupon below to receive desired information; requests will be handled direct by manufacturers.

1. SAFETY EQUIPMENT. *Willson Products, Inc.* 68-page general catalog (54) "Willson For Industrial Safety," divided into 4 sections (eye protection, head protection, respiratory protection, welding), with illustrations, descriptions and ordering information, gives the Willson line of industrial safety equipment.

2. WELDING SUPPLIES. *Air Reduction Co.* 36-page 2-color catalog (ADC 848) covers the complete Air Reduction line of arcwelding and oxyacetylene welding supplies and accessories.

3. SOCKET SCREWS. *The Bristol Co.* Two 20-page 2-color bulletins give features, manufacturing methods and applications of the socket screw line; includes tables of nominal sizes, basic dimensions, tolerances and engineering data.

4. SOLENOID VALVES. *J. D. Gould Co.* Bulletin (F-1) describes and illustrates new direct lift solenoid valves (Type F brass and Type G stainless steel), with renewable metal seats.

5. ELECTRIC TOOLS. *Porter Cable Machine Co.* 25-page catalog (101) describes 52 portable electric tools and kits with over 400 accessories, includes 150 photos of tools and their uses with specifications and prices.

6. FLAME ARRESTERS. *Air-Maze Corp.* Catalog sheet gives details of 8 models of Tank Vent Flame Arresters by Air-Maze; includes photos, operating and design data, and complete specifications with "how to specify" information.

7. GEARS & SPROCKETS. *Universal Gear Works, Inc.* 200-page comprehensive catalog gives specifications and prices on 8,000 stock items including gears, sprockets, chains, splines, etc.; shows also pictorially the manufacturing facilities of Universal.

8. CENTRIFUGAL PUMPS. *Worthington Corp.* 8-page 2-color bulletin (1230-B1) gives complete details of construction, specifications and component parts of the Blue Brute Contractors' Portable Self-Priming Centrifugal Pumps; rating charts show performance requirements.

9. RAILWAY CAR LIGHTING & AIR CONDITIONING BATTERY. *Electric Storage Battery Co.* Several unit file folder package on the new EH Exide-Ironclad battery for railway carlighting and air conditioning contains complete details, photos, specifications and "how to order" instructions; a sheaf of order instructions, form 5711 "announcement folder," and 36-page "The Development of an Engineering Idea" booklet also included.

10. PORTABLE JACKS. *Whiting Corp.* 8-page 2-color profusely illustrated bulletin (PJC-403) "More Lift For Your Money" gives complete details on electric portable jacks for railroad repair shops; includes on-the-job photos in railroad yards, shops.

11. AIR POWER SYSTEM. *Ingersoll-Rand.* 6-page fan-fold engineering service bulletin (213-A) "A Better Air Power System," chock full of tables, photos and diagrams, describes how to find if more air is being wasted than repair and renovation of distribution system would cost; tells step by step procedures to bring system up to accepted standards.

12. AIR DISTRIBUTION. *Barber-Colman Co.* 28-page catalog (F 6597) "Uni-Flo Air Distribution Products and Square, Rectangular & Lineal Ceiling Diffusers" describes, illustrates, gives specifications and performance data on the Barber-Colman line of air distribution products.

13. PUMPS & CIRCULATING SYSTEMS. *Gray Co., Inc.* Graco Powerflo 452 Catalog describes and illustrates Powerflo pumps, circulating systems and equipment for spraying or extruding liquids, semi-liquids or semi-solids used in production, construction and maintenance.

14. VERTICAL MOTORS. *U.S. Electrical Motors, Inc.* Multicolor bulletin (1868) "U.S. Unimount Motors, Vertical Solid Shaft & Horizontal Footless Motors" graphically illustrates the improved types of U.S. Vertical Solid Shaft Motors; shows cross-section views in color.

15. METAL CASTINGS. *American Brake Shoe Co.* 8-page booklet (B-101) "Absco Metal Castings" describes characteristics of the 5 engineering types of Absco metal produced here, lists properties, carries engineering data on hardenability.

16. COMPRESSORS. *Quincy Compressor Company.* 8-page 2-color folder (1000A) gives complete data, illustrates and gives specifications for water cooled Quincy compressors with Safe-Q-Lube for heavy duty industrial use.

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(Continued from page 81)

manager, has been named vice-president in charge of sales, and *E. W. Taylor, Jr.*, chief engineer, has been named vice-president in charge of engineering. *Marshall A. Norby*, sales representative at Chicago, has been promoted to district sales manager there. *Richard E. McCoach*, sales representative at Philadelphia, has been appointed district sales manager at Cleveland. They succeed *A. P. Lyvers* and *J. A. Peppard*, respectively, who became consultants on special assignments.

■

R. Lee Mitchell

NEW YORK AIR BRAKE COMPANY.—*R. Lee Mitchell*, formerly assistant to the vice- president in charge of railroad sales, has been named general manager of the Railroad Sales Division. *K. E. Keiling*, who was vice-president in charge of railroad sales, has retired, but will continue as a director of the company.

Mr. Mitchell joined New York Air Brake in 1942 as manager of the Western Division, and in 1953 was appointed assistant to the vice-president in charge of railroad sales. Before joining the company he was a special representative for the Alpha Portland Cement Company, St. Louis, Mo.

■

WESTERN RAILROAD SUPPLY COMPANY.— *George L. Hudson*, executive vice-president at Chicago, has been elected president, succeeding S. E. Gillespie, who has retired but will continue to serve as consultant.

■

ACF INDUSTRIES.—*John H. Van Moss*, formerly western sales manager at Chicago, who, at the request of ACF, remained two years beyond normal retirement age as a sales consultant for western territory, has retired. He is now associated with his son, *John H. Van Moss, Jr.*, railway supply sales representative at Chicago.

■

A. M. BYERS COMPANY.—*Harry R. Rowland*, assistant general manager of sales, has been appointed general manager of sales, and *Edgar L. Fix*, assistant manager steel sales, has been named manager steel sales.

■

WESTINGHOUSE ELECTRIC CORPORATION.—*Carroll V. Roseberry* has been appointed manager of a newly formed electric utility and transportation sales department. *C. F. Sponsler*, formerly

manager of the marine and land transportation section of the transportation sales department, has been appointed manager of the transportation section of the new department.

■

AIR REDUCTION SALES COMPANY.—A 20-min. movie, with sound, has been produced on the Heliweld Process—Airco's tungsten inert-gas arcwelding process for the rapid joining of light gages of the so-called "hard-to-weld" metals and alloys. The movie, "Nothing But the Best," shows manual, semi-automatic and completely mechanized Heliwelding equipment in use in customer's plants and is colorfully animated to show in detail how the process works. It may be borrowed from any Air Reduction office, or by writing the company at 60 East 42nd street, New York 17.

■

C. E. Carothers

WESTINGHOUSE AIR BRAKE COMPANY, Air Brake Division—*C. E. Carothers*, a representative at New York, has been appointed assistant manager, southeastern district, at Washington, D.C.

■

MILLER BEARINGS COMPANY.—*Earle M. Harshbarger*, formerly manager of railroad sales, SKF Industries, Inc., has become associated with the Miller Bearings at Lakeland, Fla., as a manager of the railroad department.

■

EDGEWATER STEEL COMPANY.—*George C. Gentry*, director of engineering and development; *Ross M. Heyl*, general superintendent; and *Paul J. Nicholas*, operating superintendent.

■

PYLE-NATIONAL COMPANY.—*William F. Botensten* has been appointed district manager, railroad sales, at Philadelphia, succeeding *M. M. Connell*, deceased.

■

DUFF-NORTON COMPANY, Coffing Hoist Division.—The Duff-Norton Manufacturing Company of Pittsburgh has purchased the Coffing Hoist Company of Danville, Ill., and now operates the Coffing Hoist Division of Duff-Norton Company. Operations and personnel remain unchanged at the Coffing plant except that *Fredrick W. Coffing*, president and co-founder of the 26-year old company, has retired. He will continue to be associated with the Coffing Hoist Division, however, as a consultant. Mr. Floyd will be president

(Continued on page 88)

Cut Time in Cleaning Diesel Interiors

Cleaning the engine exterior, floors and walls need not be a time-consuming job. You can cut the time and manpower requirements of the job with Diesel Magnusol.

Safe and Sure

Diesel Magnusol is a fast-working cleaner, easily applied. You just mix the concentrated cleaner with water, and spray it on all surfaces to be cleaned. After it has soaked in for a short time, flush the cleaner and dirt away with water, leaving really clean surfaces. Diesel Magnusol is harmless to paints, to metals and to personnel. It is non-toxic and non-flammable.

For Very Dirty Jobs

. . . such as the interiors of switchers, mix Diesel Magnusol with safety solvent instead of water, but on road engines where a regular cleaning routine has been followed, Diesel Magnusol with water is all you need.

USE DIESEL MAGNUSOL FOR A MONTH

Order a trial drum. Use the Diesel Magnusol, as directed, for a month. If you are not completely satisfied at the end of the month, we will cancel the full invoice.

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Railroad Division

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Please send us a copy of the Magnus Railroad Cleaning Manual.

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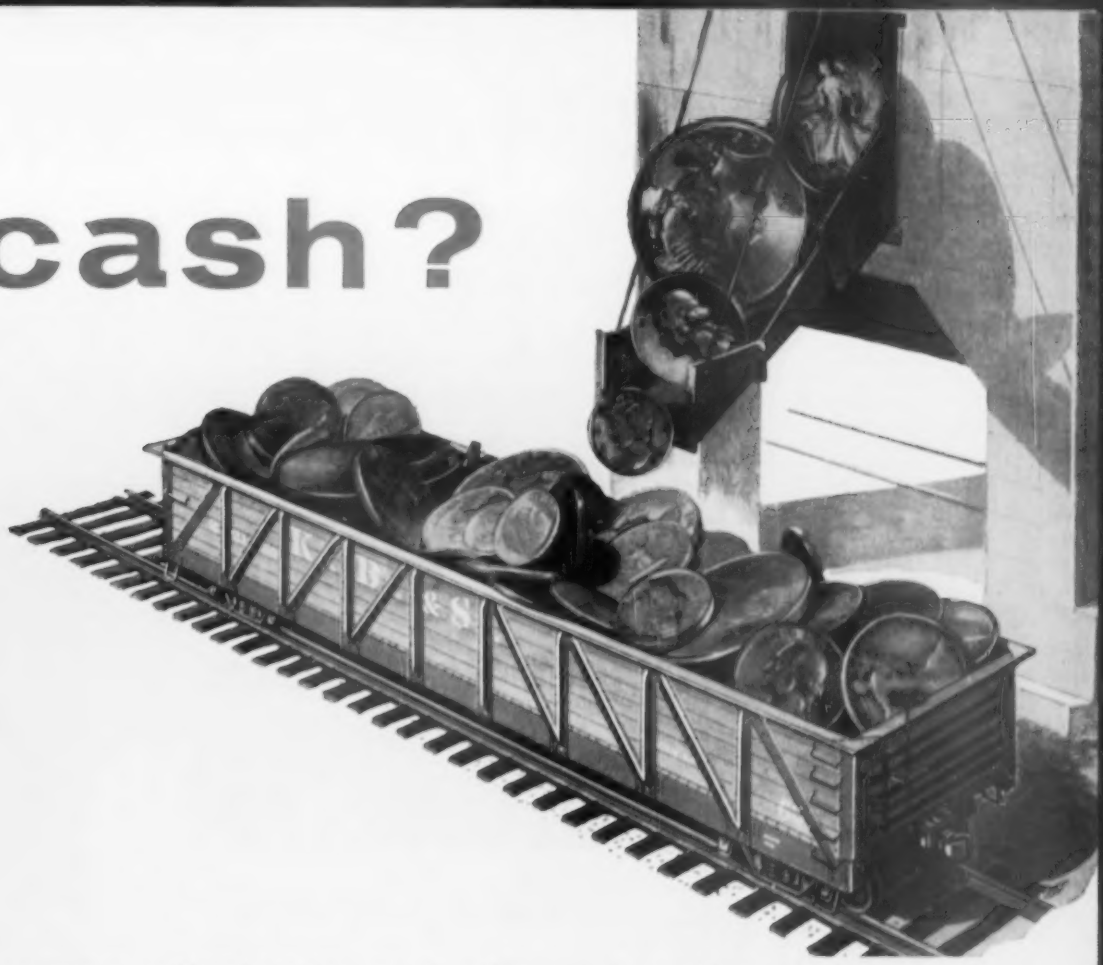
Are your freight cars collecting cobwebs . . .

. . . or cash?



You can eliminate out-of-service time, due to decay damage, by constructing or repairing cars with Koppers Pressure-Treated Car Lumber

Railroad records show that a car with *untreated* wood members usually lasts for only five years . . . before it's sidetracked for costly repairs to the lumber. And it may be months before a damaged car is earning revenue again; for railroads tell us it's necessary to wait until enough bad-order cars have accumulated to make it worthwhile to open the carshop or a repair track.

Service Life Tripled!

So it's not surprising that so many railroads have switched to Koppers Pressure-Treated Car Lumber. This lumber gives good service, on the average, for seventeen years. It outlasts *untreated* lumber better than three-to-one.

Revenue Increased!

Construction or repair of decking, sills, lining and other car members with Koppers Pressure-Treated Lumber assures those extra years of in-service revenue. And don't forget: this *protected* wood makes possible huge savings in maintenance—not to mention the out-of-pocket costs for switching cars to and from shops.

FREE ANALYSIS OF YOUR LUMBER PROBLEMS!

Let us analyze your lumber problems and then discuss with you the savings that can be effected by using Koppers Pressure-Treated Car Lumber.

KOPPERS COMPANY, INC.

Wood Preserving Division, Pittsburgh 19, Pennsylvania

KOPPERS®

PRESSURE-TREATED CAR LUMBER

(*Continued from page 85*)

of the Coffing Hoist Division as well as president of Duff-Norton. *J. R. Coffing*, vice president-sales for Coffing Hoist; *J. F. Bookwalter*, vice president-manufacturing, and *George Buck*, secretary-treasurer, continue to direct the affairs of the Coffing Hoist Division as a management committee.

■

GENERAL MOTORS CORPORATION, ELECTRO-MOTIVE DIVISION.—The New York sales region of Electro-Motive has been expanded to include the Jacksonville region, and is now known as the Eastern region. *G. M. LaRiviere*, regional manager at New York, is manager of the new region. *Charles L. Moss*, Jacksonville regional manager, has become distric sales manager at New York, and *B. K. Wingerter*, district sales manager at Jacksonville, has been transferred to a similar position at Baltimore. *W. A. Stringer*, sales representative at Jacksonville, has been promoted to district sales manager there.

■

UNITED STATES STEEL CORPORATION, AMERICAN STEEL & WIRE DIVISION.—*Norman M. Sted*, Cleveland district sales manager, has been appointed assistant general manager of sales.

■

PITTSBURGH SCREW & BOLT CORP.—*J. M. Yahres*, president, has been elected chairman of the board, and *D. D. Greenshields*, president. Mr. Greenshields is now executive vice-president and director of National Screw & Mfg. Co., which positions he will resign to assume his new duties with PS&B as of May 1. In the meantime Mr. Yahres will hold the office of president as well as chairman.

■

TRANSPORTATION FILTER COMPANY.—The *Transportation Filter Company*, Chicago, and the *Hillsboro Filter Company*, Hillsboro, Ill., have merged. All manufacturing activities were consolidated at Hillsboro. The company, which manufactures fuel and lubricating oil filters for diesel locomotives, will be known as the Transportation Filter Company, with general offices at 80 E. Jackson boulevard, Chicago.

■

BUFFALO BRAKE BEAM COMPANY.—*Allen A. Crone*, superintendent of the company's Lackawanna, N.Y., plant, has been made research and development consultant, and has been succeeded by *Clyde W. Smith*, formerly superintendent of the die division of C. L. Gugler Machine Company.

■

B. W. Carkin

AIR-MAZE CORPORATION.—*Bruce W. Carkin*, has been appointed sales engineer of railroad and original equipment installations. Mr. Carkin was formerly associated with Electro-Motive Division of General Motors Corporation in design and development of locomotives.

■

FAIRBANKS, MORSE & CO.—*William G. Herzig*, manager of railroad sales, has been appointed manager of the railroad product sales department, railroad division, with headquarters as before at Chicago, succeeding *J. F. Marquitz*, retired.

C. H. Morse, Jr., manager of the locomotive service department, has been appointed western regional manager, Railroad division.

■

AEROQUIP CORPORATION has organized a Canadian subsidiary, *Prenco-Aeroquip, Ltd.*, at Toronto, it having recently acquired all assets of *Prenco Progress & Engineering Corp.* relating to its flexible hose line and self-sealing coupling business.

■

OKONITE COMPANY.—*Richard C. Waldron*, senior engineer, has been named manager of engineering.

Okonite has moved its San Francisco

NOW...ONE WELDER

Lincoln Idealarc gives you BOTH AC and DC welding current

PLUS

- Rectifier Welder for operation on single phase current
- Rectifier Welder with *both* voltage and current controls
- Arc-booster starting on *both* AC and DC . . . at a price comparable to plain DC Welders

IDEALARC FOR FABRICATION—Choice of soft arc or forceful arc in *both* AC and DC speeds construction . . . assures solid welds in every position.

IDEALARC FOR HARDSURFACING—Choice of AC or DC in one machine means dependable results at low cost with every hardsurfacing electrode.

Get Facts Details on IDEALARC are in Bulletin 1343, available by writing The Lincoln Electric Railway Sales Company, 11 Public Square, Cleveland 15, Ohio. Railroad representatives of:

THE LINCOLN ELECTRIC COMPANY
Cleveland 17, Ohio
The World's Largest Manufacturer of Arc Welding Equipment

sales office to 701 Phelps street consolidating it with warehouse operations in new and enlarged quarters.

■

GARLOCK PACKING COMPANY.—*Ralph J. Hinkle*, vice-president has retired.

■

EX-CELL-O CORPORATION.—has acquired the *Michigan Tool Company*, which operates three plants in Michigan, and a subsidiary, *Colonial Tool Company*, Windsor, Can. Michigan Tool will continue to operate as a separate unit under its present management.

Obituary

F. Sargent

FITZWILLIAM SARGENT, vice-president—railway sales, the Budd Company, died on March 14 as the result of burns suffered while attempting to extinguish a fire in his home in Philadelphia. Mr. Sargent, who was 62, was a graduate of Harvard University (A.B. 1914). He began in the railroad supply business in 1915 and from 1931 until becoming associated with Budd in 1940 was in the coal business. In 1946, after serving in the sales department of the railway sales division of Budd, he was appointed railway sales manager, with headquarters in Philadelphia and New York. He was appointed eastern sales manager in 1945 and was elected vice-president in charge of railway sales in 1946.

■

FREDERIC SCHAEFER, 77, president of Schaefer Equipment Company, died at his summer home on Cape Cod, Mass., February 20.

■

CHESTER F. SAMPSON, western representative of the Franklin Balmar Corporation at Chicago, died on March 2 after a long illness. Mr. Sampson began his railroad career on the Michigan Central and entered the service of the Franklin Railway Supply Company, of which Franklin Balmar is a subsidiary, as a service representative in April 1923.

■

FREDERICK S. STALLKNECHT, 62, former manager of sales development for the Primary Battery division of Thomas A. Edison, Inc., died at the University of Pennsylvania Hospital, Philadelphia, February 12.

EQUIPMENT (*Continued from page 23*)

in two heavy-duty styles, one an approved safety type.

One type has an insulated ethyl cellulose case that will not shatter, crack nor dent and is resistant to temperature extremes. It has a self-lubricating, hand-replaceable insulated slide switch and a special lens guard made of polyethylene.

The safety unit is approved by the U. S. Bureau of Mines. It has the same features as the other model, plus an extra lamp in the bottom cap. The device is so designed that if the lamp is broken, the filament is snuffed out before it can ignite inflammable or explosive mixtures of gas in the surrounding atmosphere.

Both units are available in either the two-cell or three-cell sizes, with a ring hanger, and lateral-grooved case for sure grip. *National Carbon Compan, a Division of Union Carbide & Carbon Corp., 30 East 42nd Street, New York 17.*

Collapsible Tap

These Type MC taps have a micrometer adjustment in increments of 0.001 in. that permits quick and accurate sizing, sizes,

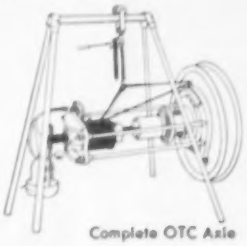
PULLS AXLE JOURNAL ROLLER BEARING IN *LESS* THAN 20 MINUTES

WITH NEW OTC 100 TON HYDRAULIC PULLER

Yes, in 20 minutes or less the toughest Axle Journal Roller Bearing can be removed without pressing off the wheels — without distortion or damage. The new OTC 100 Ton Hydraulic Ram and attachments work on SKF or Timken Bearings — handle removal and installation with surprising speed.

Wheel fit is not disturbed; eliminating the need for costly turning and refitting. The savings in man hours alone are enough to pay for the tool in a short time.

This is only one of hundreds of pulling jobs which can be done easier, safer and faster with OTC Hydraulic Pulling Tools which are available in 17½, 30, 50 and 100 Ton sizes. Learn how you can save on every pulling job by writing for complete information.

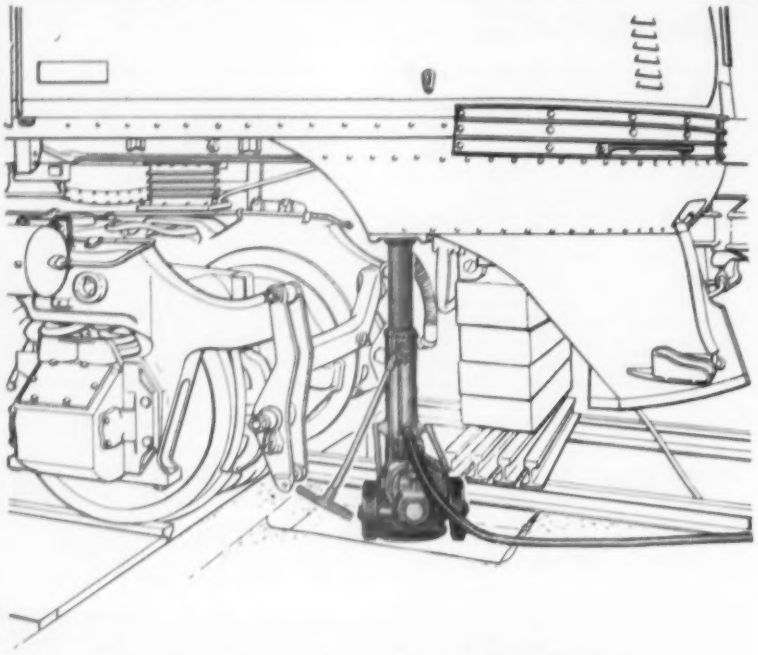


Complete OTC Axle Journal Bearing pulling unit with standard hoist frame.

Placing OTC 100 Ton Hydraulic Ram and pulling unit into position on Axle Journal Bearing. Electric pump at right then exerts necessary pressure to remove bearing without damage.

WRITE FOR FREE HYDRAULIC PULLER BOOK

OWATONNA TOOL CO.
470 CEDAR STREET, OWATONNA, MINN.



How One Man Can Raise the Heaviest Diesel Locomotive in a Few Minutes!

Take two Duff-Norton Air Motor Power Jacks, wheel them into position under the locomotive frame, connect them with an air hose "Y," turn the valve that starts compressed air into the jacks' built-in air motors, then sit down if you wish and watch as the load goes up evenly, smoothly, safely—in a few minutes you can proceed with repairs. Locomotive trucks, for example, can be completely replaced in about 2 hours!

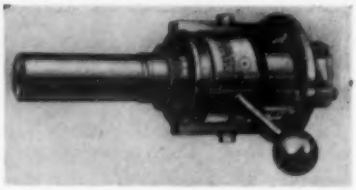
Tests conducted by various railroads in their own shops have shown savings in time and labor that pay for these air motor jacks in a few months.

Get the complete specifications of the various time and labor-saving Duff-Norton Air Motor Power Jacks. They vary in capacity from 20 to 100 tons. Write the world's oldest and largest manufacturer of lifting jacks for catalog AD-11E, the Duff-Norton Company, P.O. Box 1889, Pittsburgh 30, Pa. Canadian plant—Toronto 6, Ontario.

DUFF-NORTON

"Giving Industry A Lift Since 1883"

Jacks



range from 1 5/16 in. to 3½ in., inclusive.

Approximately three-fourths of the component parts of the series are identical and interchangeable. One complete tap and four sets of body parts will, in this manner, provide all five sizes of taps. The shanks are detachable from the tap body and can be furnished to fit any machine socket.

The taps can be used for either stationary or rotary operation. The chasers, thread ground in regular or overhanging lengths, are interchangeable with the chasers of the manufacturer's solid adjustable tap. *Modern Tool Works, Consolidated Machine Tools Company, Rochester 10, N. Y.*

Cutter and Tool Grinder

The No. 1 cutter and tool grinder, designed for grinding and reconditioning miscellaneous small tools and cutters, has a capacity of 8 in. swing and 15 in. between centers. It has a cartridge type grinding wheel spindle mounting with a double row of preloaded anti-friction bearings, packed in grease.

A reversible ½-hp motor drive, built-in to the wheelhead, provides the desired direction of grinding wheel rotation to suit any particular application. Spindle speeds of 6,260 or 3,730 rpm are obtained from a tooth grip drive belt and sheave arrangement. Grinding wheel collets are quickly interchanged by removing a socket head screw.

The 360-deg eccentric wheelhead swivel adds 3 in. to the conventional cross range of 4½-in., facilitating surface grinding operations. Another innovation is the swivel table "tange bar" taper setting device. Utilizing precision gage blocks, the taper

New SIOUX Electric IMPACT WRENCH

No. 325 only $99.75
No. 330 only $127.50

Now you can have the extra power and performance of a SIOUX Impact Wrench!

In no type of tool is good design and quality manufacture more important . . . nowhere will traditional SIOUX dependability and long life be more apparent and more rewarding.

with the EXCLUSIVE REVERSE CAP SWITCH LOCK!

Your SIOUX Impact Wrench *can't be reversed with the switch on!* This exclusive design feature eliminates a common cause of burned commutator—brushes, and switch contacts. It's one of the reasons SIOUX Impact Wrenches will last longer!

SPECIFICATIONS

Wrench No.	Capacity Bolt Size	Socket Drive Size	PRICE
325	⅜"-⅝"	½" sq.	$ 99.75
330	⅜"-1 1/16"	½" sq.	127.50

Free Speed R or L 2,000 RPM, Both Models; Impacts Per Minute 2,000, Both Models

For more information write today!

Please send complete information and prices on
SIOUX IMPACT WRENCHES

NAME _____

ADDRESS _____

ALBERTSON & CO., INC.
SIOUX CITY, IOWA, U.S.A.

USE SIOUX ALL THE WAY THROUGH . . .

ELECTRIC DRILLS • SANDERS • POLISHERS
GRINDERS • SAWS • IMPACT WRENCHES • VALVE SERVICE EQUIPMENT

Special Railroad Mount

Strand FLEXIBLE SHAFT GRINDERS

Designed for RR Shop Use

For grinding, sanding, rotary filing, wire brushing, drilling, deburring or polishing. With this new Railroad Mount, you take the Strandflex machine right to the work. You'll find it invaluable for a variety of different jobs in diesel shops, car shops. Promotes efficiency; workers lift only the tool—not the heavy motor.

Also Gasoline Powered Unit for Bridge or Maintenance of Way Depts.

All-purpose compact 5 hp. gasoline engine powered STRAND Flexible Shaft machine, governor controlled operating speeds from 2200 to 3200 rpm. Ideal for grinding rail welds, wire brushing before painting, smoothing concrete, etc. Makes you independent of electric power and air compressors.

Write for details on STRAND Flexible Shaft Machines specially designed for railroad use.

FRANKLIN BALMAR CORPORATION

Woodberry, Baltimore 11, Maryland
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IF YOU MEASURE SPEED • • • YOUR BEST BET IS BIDDLE

Average Measuring RPM or FPM Jagabi® Speed Indicator

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Instantaneous Speeds or Variations in Speeds. Write for BULLETIN 35-X

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ELECTRICAL TESTING • SPEED MEASURING INSTRUMENTS • LABORATORY & SCIENTIFIC EQUIPMENT

device enables the operator to quickly position the swivel table and obtain a higher degree of accuracy.

The double-end anti-friction spindle of the universal workhead accomodates No 12 B&S or No 5 Morse taper shanks on one end and No 50 series National Standard on the other end. Clearance setting dials on both the workhead and left-hand tailstock permit setting for predetermined clearance angles.

Electrical controls are built-in, recessed in a compartment at the front of the machine. A disconnect switch shuts off current if the door is opened. Additional safety is provided by the transformer which reduces the voltage to 110 at the push buttons. A wide variety of attachments extend the range of the machine for sharpening miscellaneous small cutters including those of sintered carbide. *Cincinnati Milling Machine Co., Cincinnati 9.*

Aluminum-Sheathed Cable

Designated Okotherm-insulated, this aluminum-sheathed cable is designed for continuous operation at 150 deg C and up to 200 deg C, under certain conditions. Available for both power and control cable circuits, it is said to provide a labor-saving advantage through its built-in aluminum conduit.

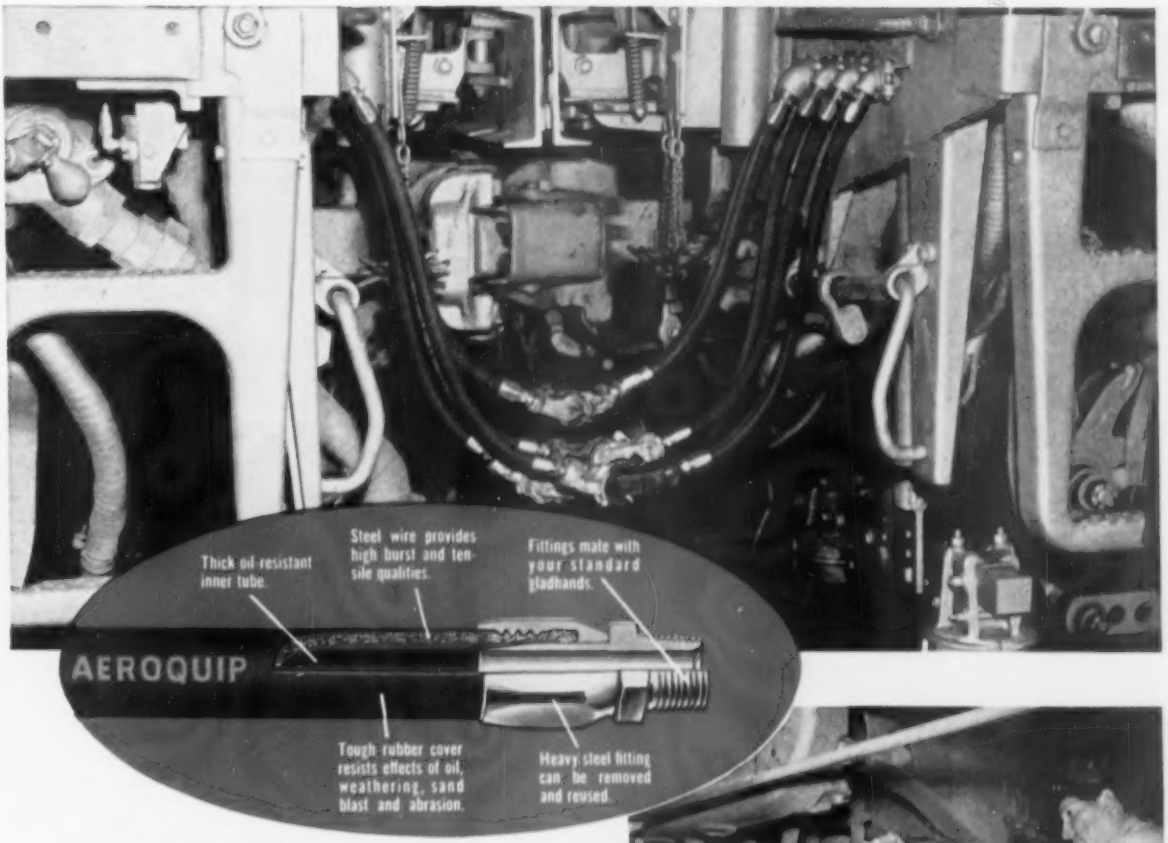
According to the manufacturer, these are the main advantages: flame and heat resistance; no conduits and related "pulling-in" problems; moisture and ozone resistance; space-saving small diameter; light weight for easy handling; high dielectric strength; and corrosion resistance. *The Okonite Company, Passaic, N. J.*

Self-Propelled Welder

This electric-driven self-propelled undercarriage supports electric welding sets such as

(Continued on page 96)

New Aeroquip Air Brake Hose Lines Cut Replacement Costs For Santa Fe R.R.


Thick oil-resistant inner tube.
Steel wire provides high burst and tensile qualities.
Fittings mate with your standard gladhands.
AEROQUIP
Tough rubber cover resists effects of oil, weathering, sand blast and abrasion.
Heavy steel fitting can be removed and reused.

The Santa Fe is one of the first major railroads to utilize Aeroquip air brake hose lines for replacements on diesel-electric locomotives and passenger cars. It is estimated that savings will amount to many thousands of dollars a year. Here's why:

(1) Aeroquip fittings are detachable. They may be used again and again for making new hose lines.

(2) With Aeroquip, inventory may be reduced to several coils of bulk hose and a few fittings. Hose lines can be made quickly by cutting the hose to length and attaching the fittings. Only ordinary shop wrenches are needed.

Cut costs! Save time! Start using Aeroquip air brake hose lines as soon as possible. Write for complete information today.

Aeroquip

REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

87 world's

Result of intensive study by Magor and Orinoco Engineers . . .

These ore cars utilize the best features of existing ore cars, with a number of innovations and improvements for service on the Orinoco. ASF Ride-Control Trucks, Bolsters, Simplex Brakes and Type "F" Interlocking Couplers are standard equipment.

They've found the answers to some problems that are unique in railroading . . . on

miles of the toughest main line!

• To fully appreciate what "Orinoco" means to railroading, you'd have to run a 15-thousand-ton train through 87 miles of rough terrain involving a 3% grade. That, in brief, describes United States Steel's engineering feat that stretches from the Orinoco mine face to the Puerto Ordaz docks in Venezuela.

Hauling heavy loads under these conditions calls for unusually rugged ore cars. Magor Car Corporation is providing the answer: cars that are designed to take extreme punishment—*almost continuously*. Otherwise, repairs would run costs sky-high in an area with restricted maintenance opportunities.

Smooth-riding ASF Ride-Control Trucks mean less damage to the cars and roadbed. ASF Simplex Clasp Brakes ease the loaded cars down the grade, and ASF Type "F" Interlocking Couplers provide the needed additional strength and protection against accidental train partings.

It's a source of pride that ASF was selected to furnish the basic running gear, of course. The problems of the Orinoco were a challenge to the best we had to offer. Helping to solve them is the kind of experience that keeps ASF in step with progressive railroading.

AMERICAN STEEL FOUNDRIES

410 N. Michigan Avenue, Chicago 11, Illinois

Canadian Sales: International Equipment Co., Ltd., Montreal 1, Quebec

ASF

World's largest builders of railroad running gear

Diesel liner and piston before removing caked carbon and film.

The same liner and piston after soak cleaning with LIX Diesel Klean Heavy.

SOAK AWAY CAKED CARBON WITH LIX DIESEL KLEAN HEAVY

- NO BRUSHING NECESSARY
- LEAVES NO GRANULAR DEPOSITS
- REDUCES AFTER-RUSTING
- DOES NOT INTERFERE WITH PARTS INSPECTION

Lix is harmless to all types of metals during the cleaning cycle. Cleans any metal safer and faster...and in the same tank. Leaves no granular deposit on close tolerance screw threads.

All working parts of Diesel Locomotives, such as Injection Nozzles, Bronze Filters, Bearings, Aluminum Air Blowers, Lube Oil Coolers, etc., can be cleaned more economically.

All spent Lix Diesel Klean can be reduced and used for cleaning trucks, pits, and etc.

Manufacturers of Lix Diesel Klean Heavy and Lix Electric Equipment Cleaner

A LIX Representative Will Be Glad To Demonstrate In Your Shop How He Can Save You Time and Money.

WRITE OR CALL TODAY FOR A FREE DEMONSTRATION IN YOUR SHOP!

THE Lix CORPORATION

PRODUCTS OF RESEARCH

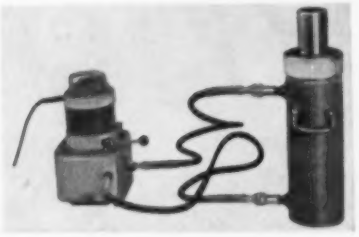
716 EAST 85TH STREET, DEPT. RL-4
KANSAS CITY, MISSOURI

(Continued from page 92)

the Lincoln machine illustrated. Rugged construction, simple design and low cost are advantages claimed for this undercarriage which permits bringing the welding machine within a few feet of the welding operation in railway shops and car repair yards, for example, utilizing short cable leads. This saves man-power, time, cable and contributes to better welds, plus better satisfied workmen due to greater ease in operation.

Two models of Ellingsworth electric undercarriage are available, the Model 60 for 200-amp machines (42¼ in. wide) and the Model 70 for 300- and 400-amp machines (51 in. wide). Propulsion is supplied by an electric motor with gear-head designed and wired to operate from dc current supplied by the welding generator. The motor is rated at ⅔ hp and built to absorb 2 hp shock loads. Both motor and gear reducer are equipped with ball bearings for long trouble free operation. Drive to the main wheels is by a chain and sprocket, the chain being easily disengaged for over the highway towing on long hauls.

The undercarriage will operate in either direction by pushing a button clearly marked on the steering handle. Control is maintained through electric solenoid switches which are actuated by the push button. Since safe operation is imperative, both sides of the circuit on the motor and solenoids are disconnected when not in use. The steering handle which must be pulled down for operating the undercarriage also controls the master switch and if released returns to upright position opening all circuits. When the handle is pulled down the operator selects and pushes the button for the desired direction. Travel stops when the button is released. Welding machine controls can be set at maximum or minimum and in no way effect operation of the undercarriage. *Ellingsworth Products Company, Louisville 4, Ky.*



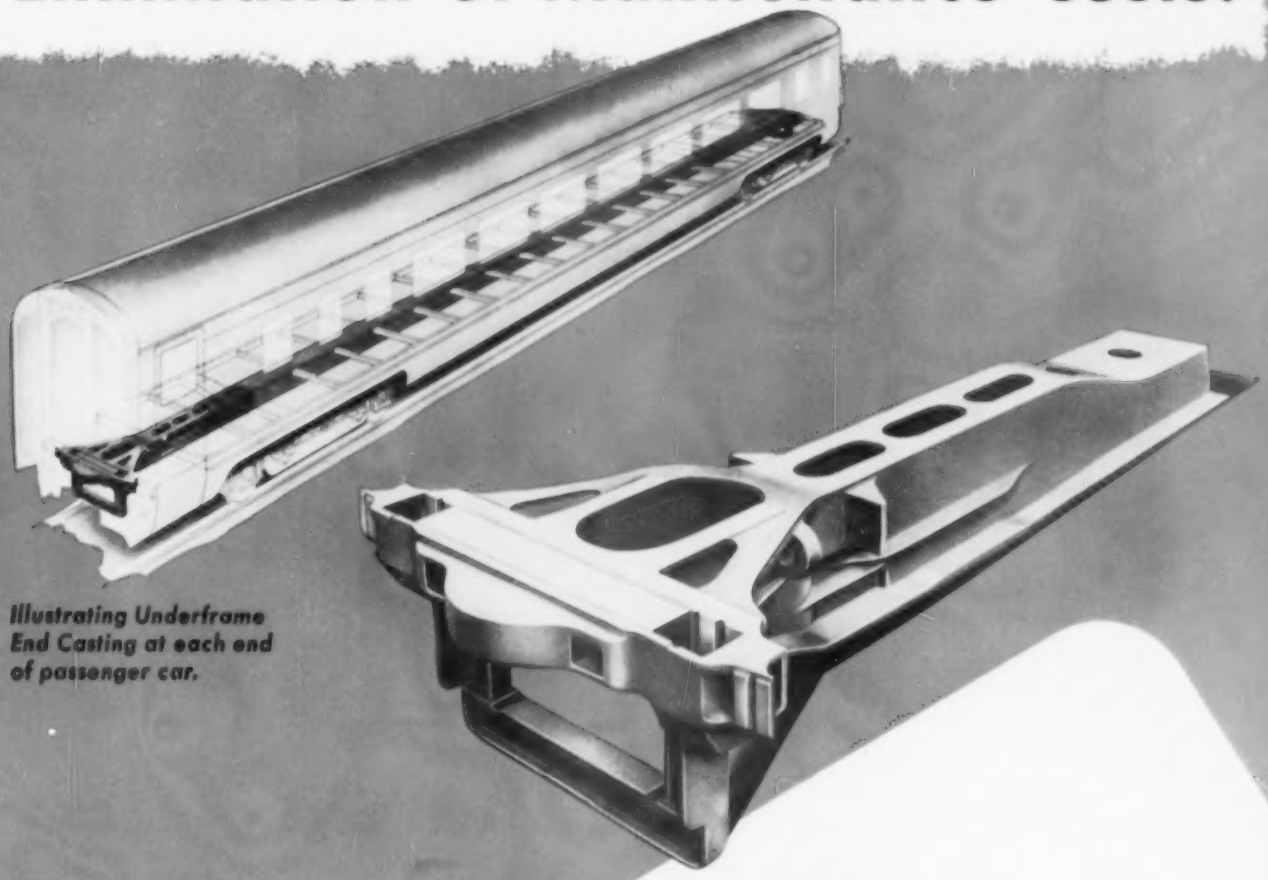
Hydraulic Jack and Puller

Designed for heavy duty jobs, this hydraulic jack and puller is equipped with a separate motor-powered pumping unit. The jack's hydraulic ram can be both raised and lowered by power to permit faster retraction so that the ram may be positioned more quickly.

Called the Model RP798CO-6010 Re-Mo-Trol, the jack has a 10 in. travel. The ram is equipped with a center hole which permits pulling without the necessity for

(Continued on page 100)

For Greater Strength, Safety and Elimination of Maintenance Costs!



Illustrating Underframe End Casting at each end of passenger car.

Commonwealth One-Piece Underframe End Castings

COMMONWEALTH Cast Steel Underframe Ends at both ends of the car provide the simplest and strongest construction for this vital part of the *passenger car* body. Their inherent strength and ruggedness assure greater passenger safety, minimize car damage in event of collision, and eliminate maintenance expense.

These Underframe Ends incorporate in a one-piece casting unusually strong draft gear pockets and coupler carriers and, if desired, may be provided with body bolsters cast integral.

For strong, better-built passenger cars, specify COMMONWEALTH One-Piece Underframe End Castings.

GENERAL STEEL CASTINGS

GRANITE CITY, ILL. EDDYSTONE, PA.

Now! Low cost protection against boxcar infestation...

Economical Johns-Manville Stonefelt (Type K) reduces contamination risks, cuts damage claims

Open corrugations filled with Stonefelt. ▶

◀ Full size pieces of Stonefelt temporarily in position.

End lining is applied the usual way. ▶

Many costly claims can be avoided by filling the spaces behind boxcar linings where contaminating conditions can exist. When you protect these areas with Johns-Manville Stonefelt® (Type K), danger from insect infestation, corrosion, mold and odor is controlled at the source.

Stonefelt is made of specially treated mineral fibers felted into lightweight batts that *will not settle or shake down*. Strong and durable, its uniform structure of finely divided fibers stops the entrance of insects; acts as a barrier against dust and dirt.

Stonefelt fibers are inert, are not affected by moisture, will not sustain insect life. Virtually indestructible in service, Stonefelt provides continued protection against mold, odors and corrosion.

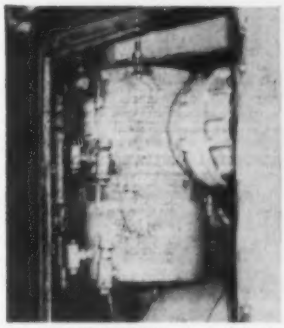
Stonefelt Type "K" is furnished in cut-to-fit box car sets. Individual pieces are supplied up to 30" x 60" to assure maximum ease of handling. Regular car men can easily apply this material.

Ask your Johns-Manville representative for complete data and samples, or write to Johns-Manville, Box 60, New York 16, N. Y.

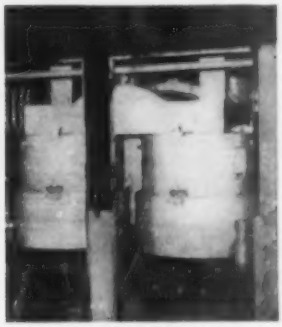
Johns-Manville 97 YEARS OF SERVICE TO TRANSPORTATION

Two of the hundreds of AIR-MAZE oil bath diesel filter installations that...

OPERATE UP TO 24 TIMES LONGER WITHOUT SERVICE—PAY FOR THEMSELVES IN A YEAR!



ILLINOIS CENTRAL. An oil bath filter on ELECTROMOTIVE 1200 horsepower switcher.



CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC. A 2 unit, manifolded oil bath filter, in use on ALCO 1000 horsepower locomotive—typical switcher application.

TWENTY-TWO RAILROADS now have Air-Maze oil bath filters on the air intakes of hundreds of diesels for freight, passenger and switching service. Result: reduced servicing costs, less diesel engine wear and turbo-charger maintenance. Reports indicate that savings from Air-Maze oil bath filters equal their cost in only one year!

In areas where airborne dirt concentrations are heavy, ordinary filters must be cleaned as often as twice a week. By contrast, Air-Maze oil bath filters go at least three months without changing oil! That's 24 times longer without service! Air-Maze oil bath filters cut engine overhaul costs by scrubbing intake air clean in a bath of oil. Abrasive dust and dirt can't get through to wear out rings, ring grooves and liners. And because there's less build-up on the turbo vanes, these filters also reduce turbo-charger maintenance. Turbo wheels stay in balance, bearings last longer.

Some day all diesel locomotives will have oil bath filtration. Over 98% of all internal combustion engines in use today are protected by oil bath filters. Air-Maze oil bath filters are effective at all engine speeds—do not depend on high air velocity. They work effectively at low pressure loss. And they are not affected by humidity or oil mist conditions. For further information on how Air-Maze oil bath filters can help cut your diesel locomotive filtering costs, call on us or see your locomotive builder. The Air-Maze Corporation, 25000 Miles Ave., Cleveland 28, Ohio.

AIR-MAZE OIL BATH FILTER MODELS AVAILABLE FOR THESE LOCOMOTIVES

MFR.	HP	SERVICE	MFR.	HP	SERVICE
Electromotive	800-900	Switcher	Alco-GE	2250	Rd. Switch
Electromotive	600	Switcher	Alco-GE	2250	Rd. Pass.
Electromotive	1000	Switcher	GE-Cooper Bess.	600	Switcher
Electromotive	1200	Switcher	B-L-H	800	Switcher
Electromotive	2000	Rd. Pass.	B-L-H	1000	Switcher
Electromotive	2250-2400	Rd. Pass.	B-L-H	1290	Switcher
Electromotive	1350	Rd. Freight	B-L-H	1500-1600	Rd. Switch
Electromotive	1500-1750	Rd. Freight	B-L-H	1500-1600	Rd. Freight
Electromotive	1500-1750	Rd. Switch	F-M	1000-1200	Switcher
Alco-GE	900	Switcher	F-M	1500-1600	Rd. Switch
Alco-GE	1000	Switcher	F-M	2000	Transfer
Alco-GE	1500-1600	Rd. Switch	F-M	2400	Trainmaster
Alco-GE	1500-1600	Rd. Freight			

AIR-MAZE The Filter Engineers

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

New RIDGID 200 Tripod Power Drive

with

SPEED CHUCK

Light Weight...

Easily Quickly Set Up...

Built-In Folding Tool Tray and Folding Legs

Pats. Applied For

Power for any hand pipe tools —⅛" to 2" pipe, ¼" to 2" bolts; geared tools to 12".

Leg Spacing and Tool Tray

assure solid rigidity, greater strength . . . No front leg to obstruct swing of die stock handles.

Fast Easy Chucking

new principle—guaranteed to grip tight both forward and reverse, won't slip, even with geared tools . . . 3-jaw centering device turns with pipe . . . Extra-powerful motor, larger brushes, longer commutator.

Your Supply House has it—ready to demonstrate and expedite your order.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U.S.A.

RIDGID
Work-Saver Pipe Tools

use

F.O.-102

the chlorinated

CARBON REMOVER

for Hot Tank Dip

To speed the cleaning operation of DIESEL PARTS put F.O.-102 to work in your maintenance departments. This highly effective cleaner has been thoroughly tested to assure top performance. . . . When used in the prescribed manner it will save hours of hand labor and add to the life of pistons, piston rings, fuel pumps, carburetors and engine assemblies.

F.O.-102

INCORPORATES ALL THE ESSENTIALS SOUGHT IN A CARBON REMOVER

- *High Flash Point*
- *Low Toxicity*
- *Non-corrosive to metal surfaces*
- *May also be used as a cold dip*
- *Meets the requirements of AF-20043A*

For Cold Dip—Use fast acting

F.O.-185

(non-inflammable — low toxicity)

TRY FINE ORGANICS' other well known accepted products:

F.O.-128 and F.O.-101—Safe-tee Solvents
F.O.-106 and F.O.-116—Emulsion Cleaners

Our representative will be glad to call upon request. Write to Dept. 3

FINE ORGANICS, Inc.

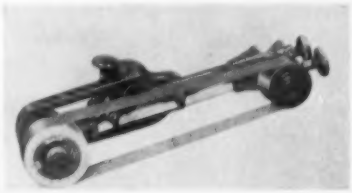
211 East 19th St. · New York 3, N. Y.

(Continued from page 96)

using elaborate back-up devices to eliminate off-center torque. Connected to the pumping unit by flexible hydraulic hose, the ram can be remotely located for greater operator safety in cramped quarters.

The pump which is powered by a ½-hp universal motor, may be operated by 115 volt a-c or d-c. It can be started or stopped without losing travel of the ram.

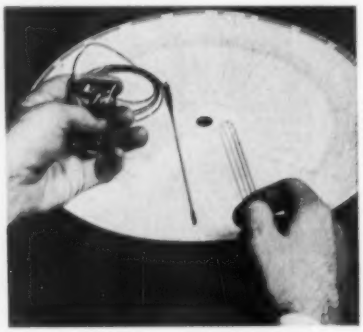
The 60-ton ram is also available with a remote hydraulic hand pump instead of the motorized unit. This model features automatic two-speed changeover on the pump. *Templeton, Kenly & Co., 2525 Gardner Road, Broadview, Ill.*



Contact Wheel Belt Grinder

This belt grinder, Model 500, is said to increase production 20 per cent or more over old grinding operations. It speeds up production on deburring, chamfering, removing flash, fine, parting lines, etc. The unit can be mounted on a bench, pillar, portable table or most any convenient place in the shop. An adjustment of 360 deg vertically is part of its design.

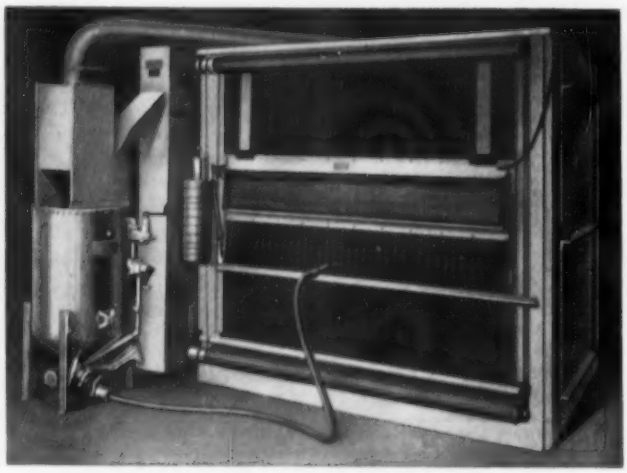
It was designed for use in machine shops, structural shops, foundries, pattern shops, molding shops, etc., where free-hand grinding is performed. The unit is useful for finishing steel, cast iron, bronze, aluminum, wood and plastics. *B & E Manufacturing Co., Inc., 407 Liberty street, Kansas City, Mo.*



Instrument Recording Pen

This featherweight, stainless steel capillary pen is fed from a clear, hermetically-sealed sac containing over a year's supply of

(Continued on page 112)



RUEMELIN SOFT GRIT BLAST

Clean your motor and generator armatures with a modern softgrit blast installation. This equipment quickly removes dirt and grease at lowest cost per unit. Eliminates use of solvents and resulting toxic fumes. This sanitary type room permits operator to stand outside blast compartment. Also used for effectively decarbonizing aluminum pistons. Used by leading diesel engine overhaul shops. Names on request.

Write for literature and prices.

RUEMELIN MFG. CO.

MFRS. & ENGRS. • SAND BLAST & DUST COLLECTING EQUIPMENT
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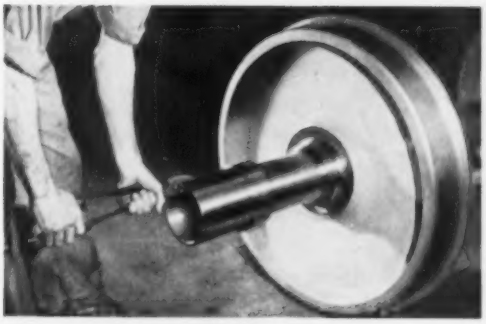
FOR LONG-HAUL ECONOMY, THERE'S ONE LOGICAL CHOICE IN JOURNAL BOXES!



Engineers can argue all they want to about the *theoretical* advantages of one type of roller bearing journal box over another. But practical railroad men judge by *performance records*—and the fact remains that *last year the lion's share of all the roller bearing journal box orders went to HYATT!*

The reason isn't just lower first cost—it's *long-haul economy!* Lower *installation* cost. Lower *inspection* cost. Lower *maintenance* cost. PLUS the important savings in wear and tear on rails, wheels and cars—*in lading damage, too*—which HYATT'S easier-riding *free-lateral* feature assures!

8 REASONS WHY HYATT BOXES BELONG ON YOUR FREIGHT CAR JOURNALS:

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2. **Easiest to Inspect**—Hyatt's amazingly easy assembly and disassembly saves dollars every inspection.
3. **Easiest to Maintain**—Simple, trouble-free construction assures less maintenance over the years.
4. **Free Lateral**—This great advantage insures less lading damage, less wear on trucks and flanges.
5. **One-piece Inner Race**—Simplifies installation and maintenance—becomes a permanent part of journal.
6. **No Pre-assembly Adjustments**—Hyatts require no adjustments—save costly time on every application.
7. **Press Fits Not Disturbed**—When removing a box or a wheel, this advantage saves added costly hours.
8. **Smaller Parts Inventory**—Spare axles and wheels need be fitted with inner races, nothing else.

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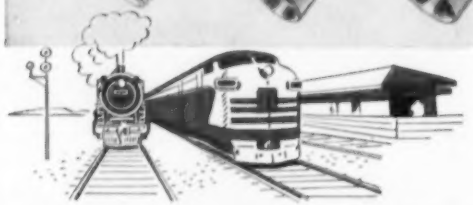

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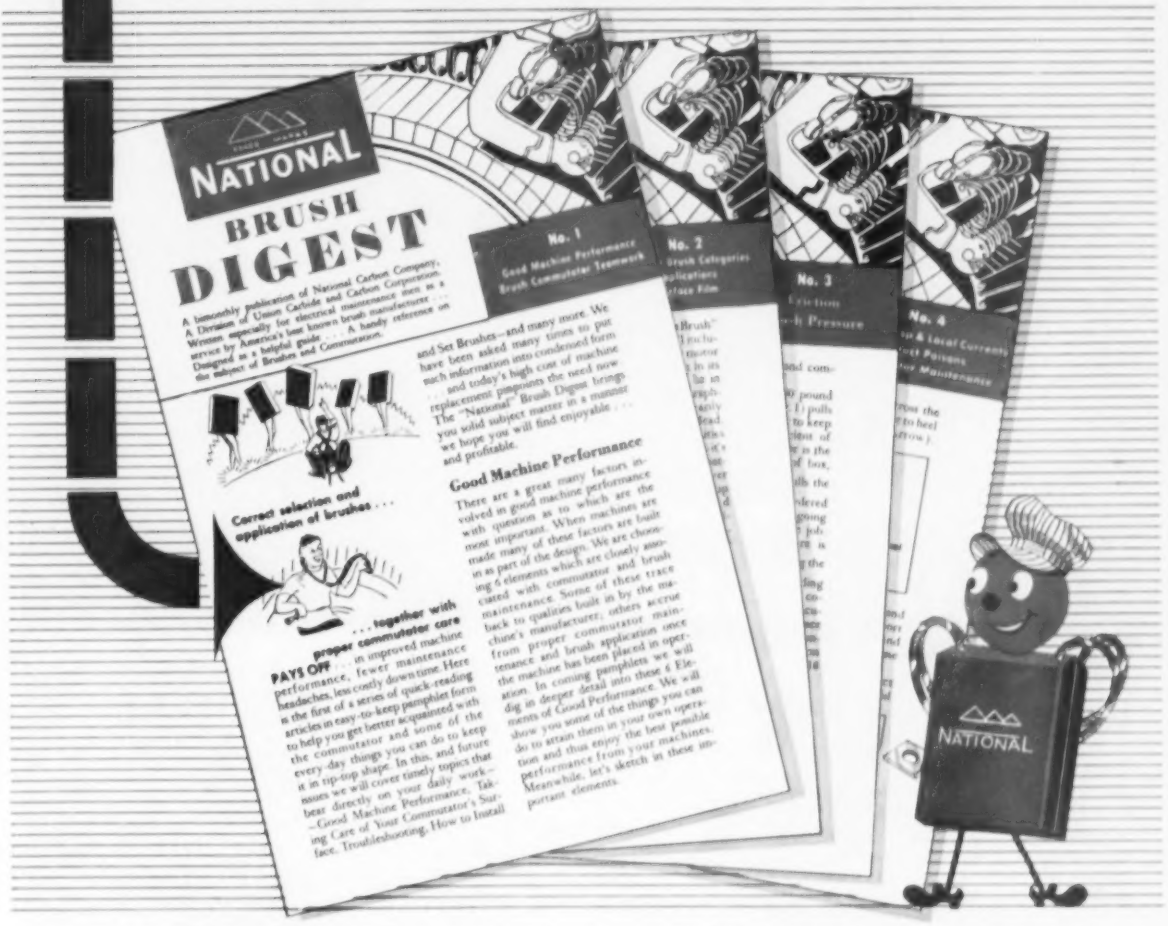

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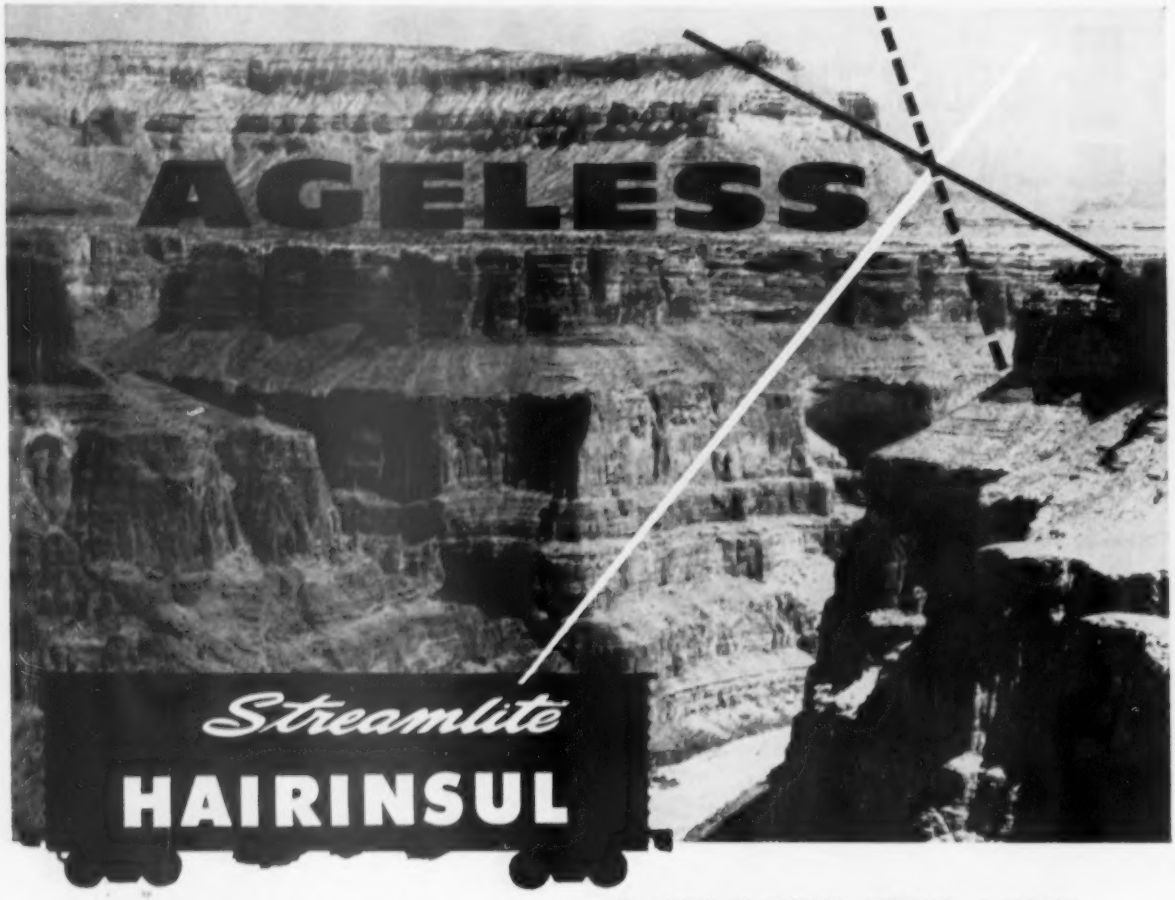
Signed . . . . .



LOW CONDUCTIVITY . . . Thoroughly washed and sterilized, all-hair heat barrier. Rated conductivity —.25 btu per square foot, per hour, per degree F., per inch thick.

LIGHT WEIGHT . . . Advanced processing methods reduce weight of STREAMLITE HAIRINSUL by 40%.

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EASY TO INSTALL . . . Blankets may be applied to car wall in one piece, from sill to plate and from one side door to the other. Self-supporting in wall sections between fasteners.

COMPLETE RANGE . . . STREAMLITE HAIRINSUL is available ½" to 4" thick, up to 127" wide. Stitched on 5" or 10" centers between two layers of reinforced asphalt laminated paper. Other weights and facings available.

HIGH SALVAGE VALUE . . . The all-hair content does not deteriorate with age; therefore has high salvage value. No other type of insulation offers a comparable saving.

OUTLASTS THE LIFE OF THE CAR

That bright new refrigerator car coming out of the shop will someday wear out, be sold for scrap or be junked, but the STREAMLITE HAIRINSUL originally used in the car can be salvaged to be used again. It actually outlasts the life of the car!

STREAMLITE HAIRINSUL's high insulating efficiency remains the same year in and year out. Records show where all-hair insulation removed from refrigerator cars after 20 years or more of service, is in like new condition. All-hair insulation does not deteriorate with age. Its salvage value is high.

At left are additional reasons why STREAMLITE HAIRINSUL is the leading car insulation. Write for complete data.

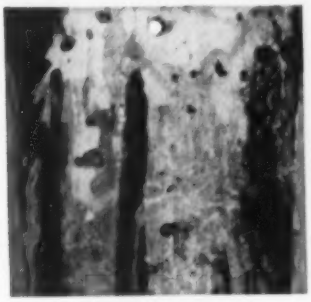
MERCHANDISE MART, CHICAGO 54

Streamlite AMERICAN HAIR & FELT CO. HAIRINSUL

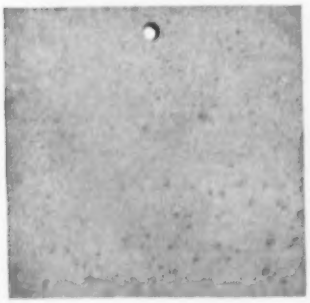
SETS THE STANDARD BY WHICH ALL OTHER REFRIGERATOR CAR INSULATIONS ARE JUDGED

Here is a test panel painted by the standard freight car paint system. The paint is on tight... free from blisters or cracks.

The same panel one minute after applying Pennsalt Cleaner 23. The paint is already loosening—even beginning to peel in spots.



Two minutes later. The paint is blistered, has not only been loosened completely, but most of it is ready to sluff away.



Three minutes later, the test is complete. The paint is gone, leaving the bare metal. The surface has rinsed clean...ready for inspection and repainting.

Make the 3-Minute Paint Stripper Test

3-Minute Timer Shows How Pennsalt Cleaner 23 strips paint from a standard freight car panel in 3 minutes . . . leaves bare metal ready for repainting.

Test Pennsalt Cleaner 23 against any other paint stripper you have ever used in your shop. Test it on any paint job, any car going through the line. Time it—and compare speed, completeness, economy.

Pennsalt Cleaner 23 can be applied by the Stripping-Rack Method, the Spot Application Method, or by the Soak-Tank Method.

• **Removes any number of coats of paint**—Pennsalt Cleaner 23 will tackle your heaviest jobs—strip cars and locomotives with 3 coats or 20 on them. This powerful blended alkali compound is ideal for tight production schedules.

• **Saves money**—Economical because it strips clean. Economical because it rinses freely without streaking, or leaving white deposits. *And it costs less than 5c a gallon of prepared paint-stripper solution.*

• **Get the complete story**—We'll be glad to send you full information on Pennsalt Cleaner 23—including a free blueprint of a paint stripping rack you can make up in your own shop. Just call the Pennsalt Railroad Service Representative in your area. Or write: Railroad Maintenance, Pennsylvania Salt Mfg. Co. *EAST:* 859 Widener Bldg., Philadelphia 7, Pa. *WEST:* Woolsey Bldg., 2168 Shattuck Ave., Berkeley 4, Calif.

Pennsalt Chemicals

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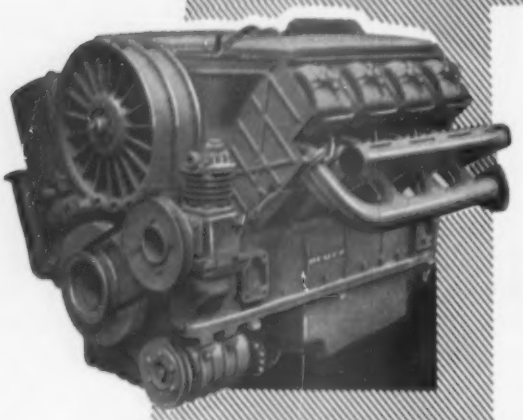

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DIESEL LOCOMOTIVES

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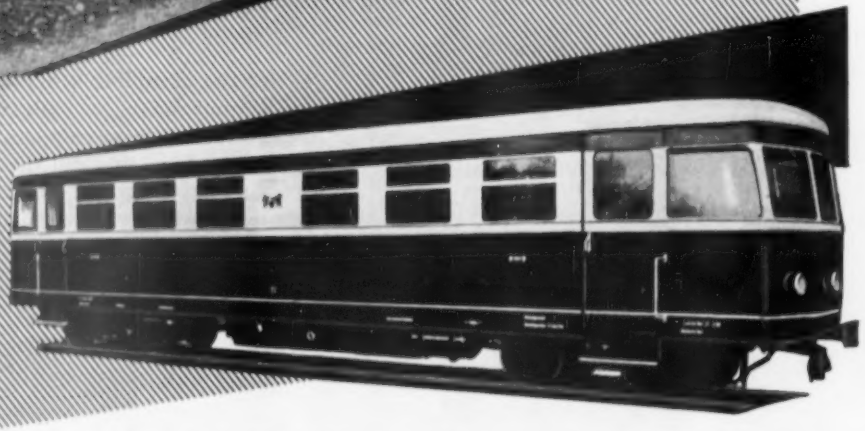

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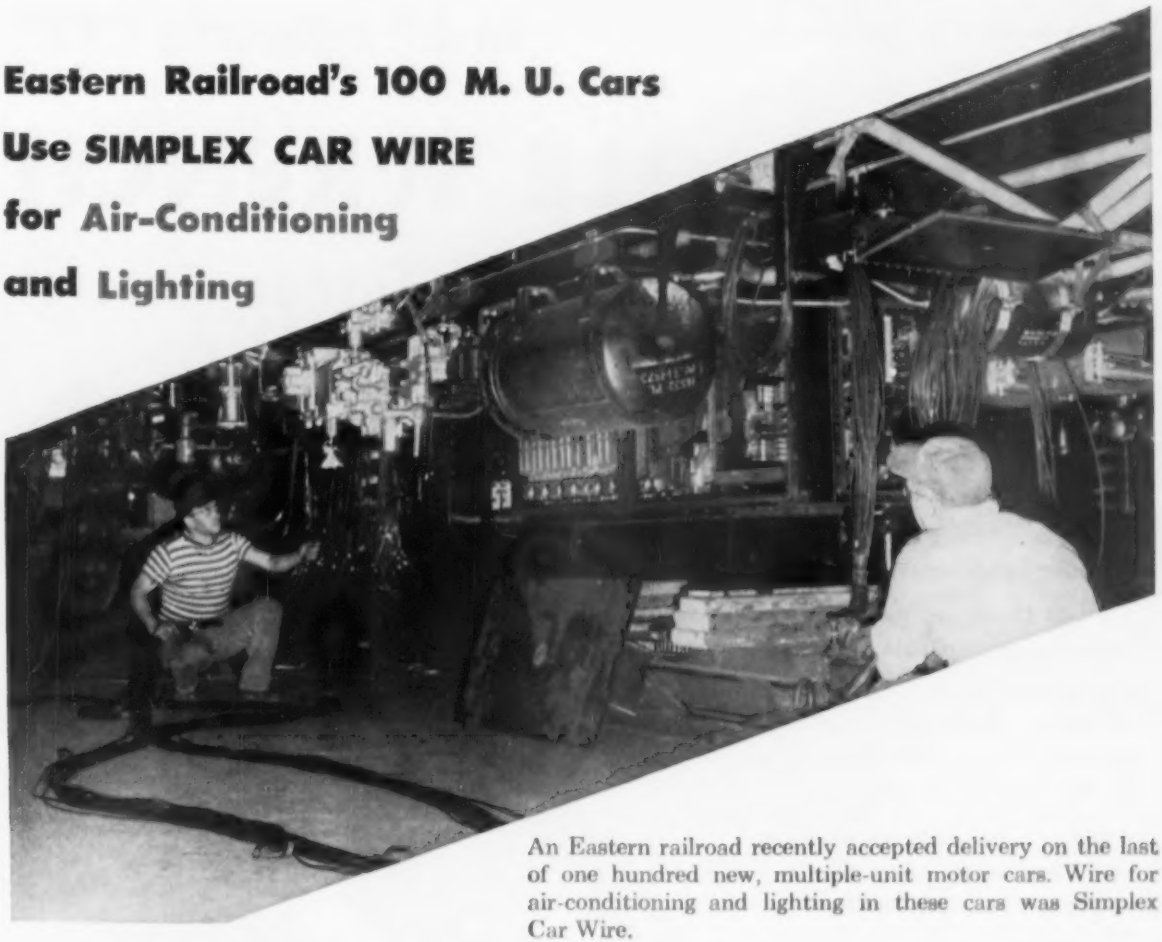

An Eastern railroad recently accepted delivery on the last of one hundred new, multiple-unit motor cars. Wire for air-conditioning and lighting in these cars was Simplex Car Wire.

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1 Simplex Car Wire, with a smooth, snag-free, tough neoprene jacket, pulls through conduits with ease.

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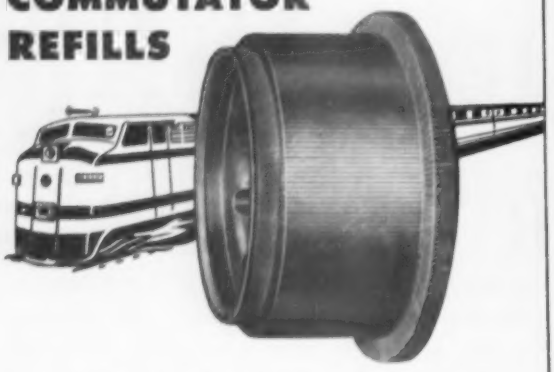

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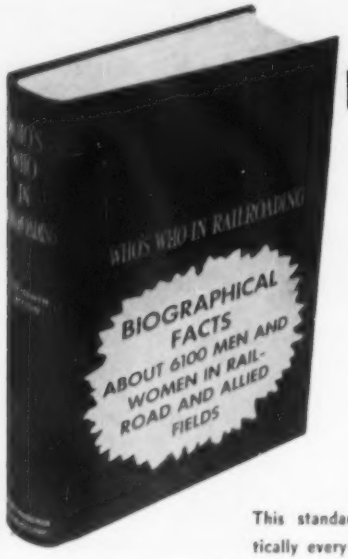

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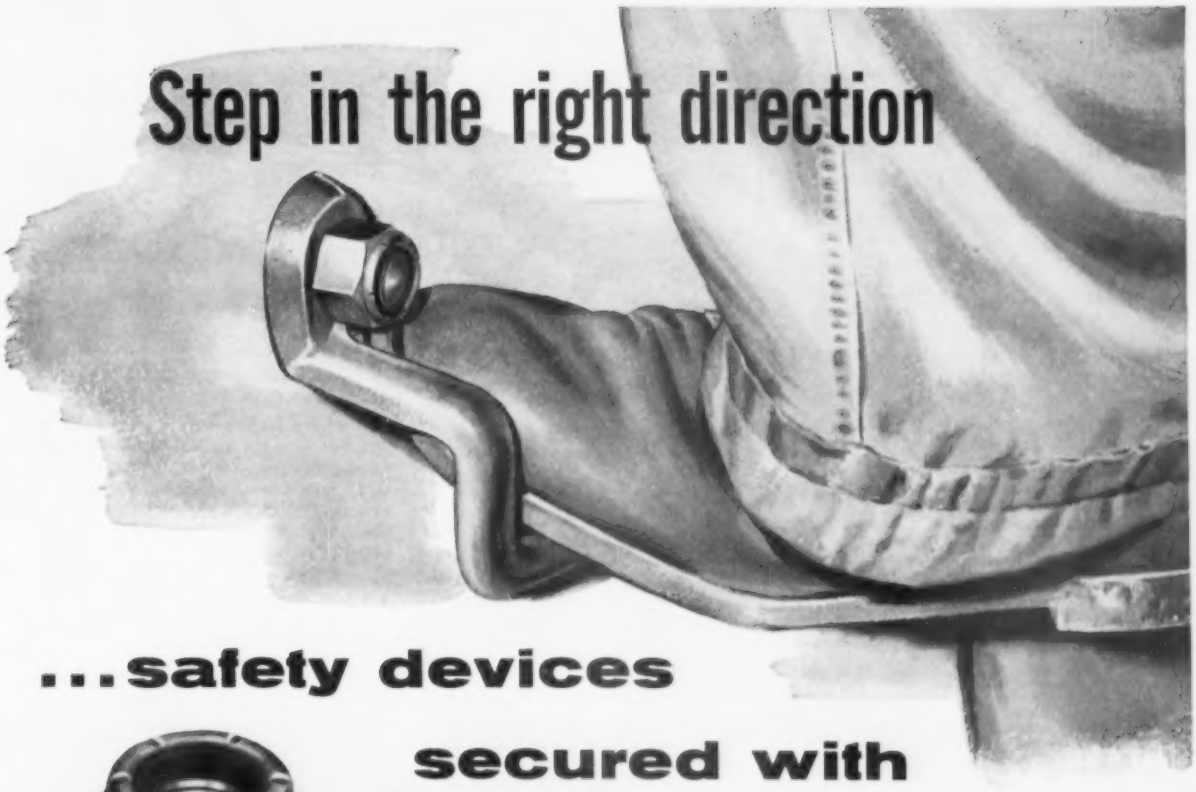
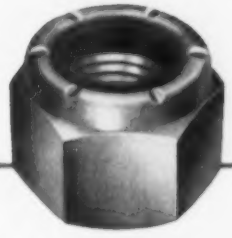


...safety devices



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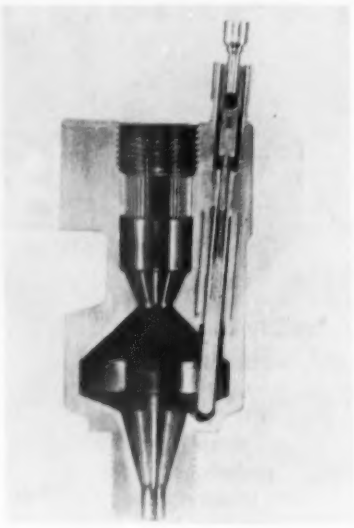

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(Continued from page 100)

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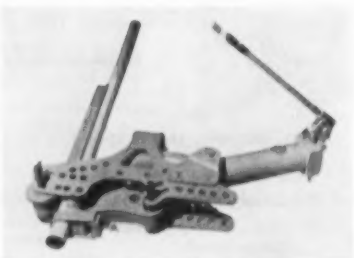

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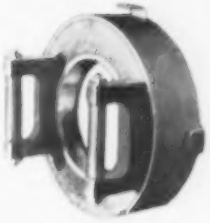

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1) *No lateral movement within the bearing.* In straight roller designs, incessant lateral movement scuffs rollers and races, shortening bearing life. Lubricant is pumped through the seal and out of the journal box, dirt and water are drawn in. The auxiliary devices in some designs, needed to take thrust loads, are hard to lubricate with grease and need more maintenance.

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2) *Positive roller alignment.* The taper holds roller ends snug against the rib, where wide area contact keeps rollers aligned. There's no skewing of rollers to upset full line contact, shorten bearing life.

Get what you pay for when you switch to roller bearings to end the hot box problem and cut operating and maintenance costs to a minimum. Get Timken tapered roller bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

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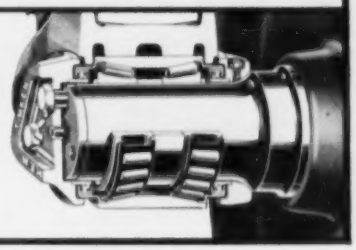

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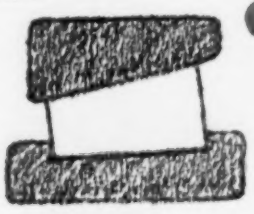

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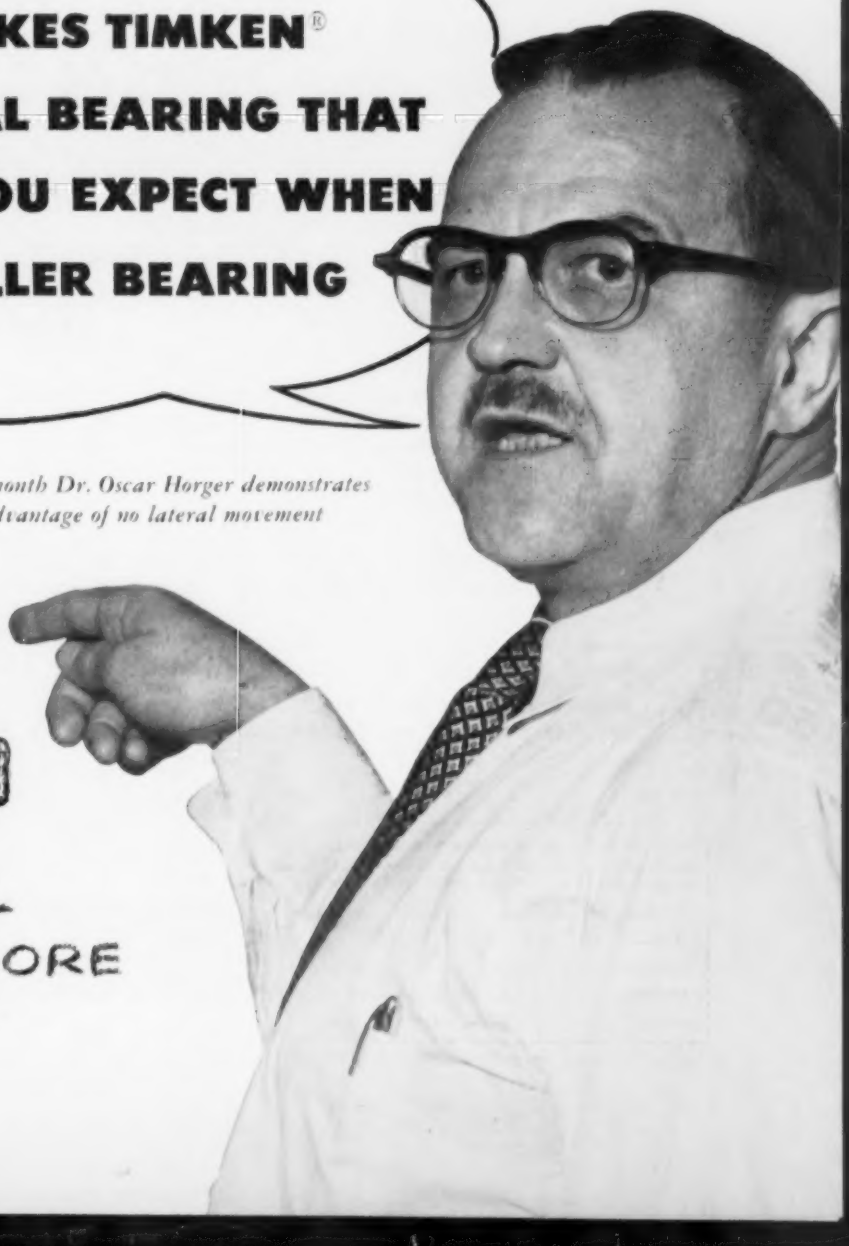
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